DECEMBER 1943

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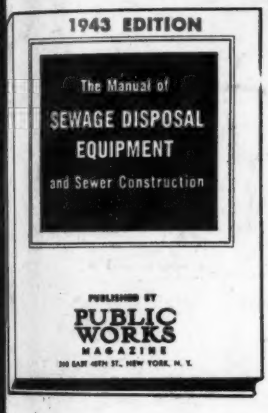
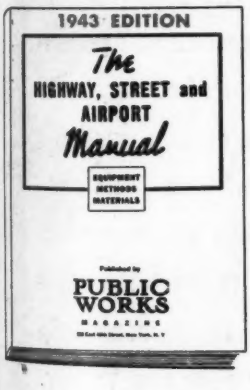
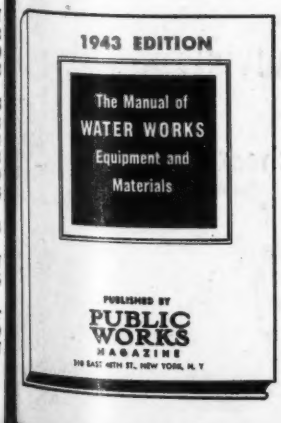
ENGINEERING
CONSTRUCTION
MAINTENANCE
OPERATION

Public Works







Are You Making *Specific* Post-War Plans?

The public expects local governments to be ready to go ahead with needed improvements promptly when the war ends.

YOU have made some plans, of course. If not, you are in an unfortunate minority. Of 1101 replies to a questionnaire we sent out a few months ago, 791 cities have replied that they have prepared or are preparing plans.

Complete plans, however, are important. If your city council or County Board gave the "go ahead" tomorrow could you pull out of the files data sufficiently detailed to enable you to get started at once? Could you order the necessary pipe, specials, valves, etc.; the desired lengths of each size of sewer, with branches, manhole heads and other appurtenances? You plan to enlarge your water or sewage treatment plant; could you set stakes tomorrow for the foundations, and have you planned to the last detail the pumps and their connections and other equipment needed? Do you know how many yards of broken stone and gallons of asphalt you want for those planned street or highway improvements?

Do you know where to get these materials? Have you a list of all who manufacture just the kind of pump or sewage plant equipment you want, with valves, gauges, automatic control devices and other details?

Then how about equipment for your street and highway work? Many of those now in use are practically worn out and should be replaced just as soon as new ones are obtainable. Perhaps some of them are obsolete or not the best type for your work. Study your needs carefully so that when you get new equipment you will select that most suitable for the work you have in view.

Use These Big Helps in Planning

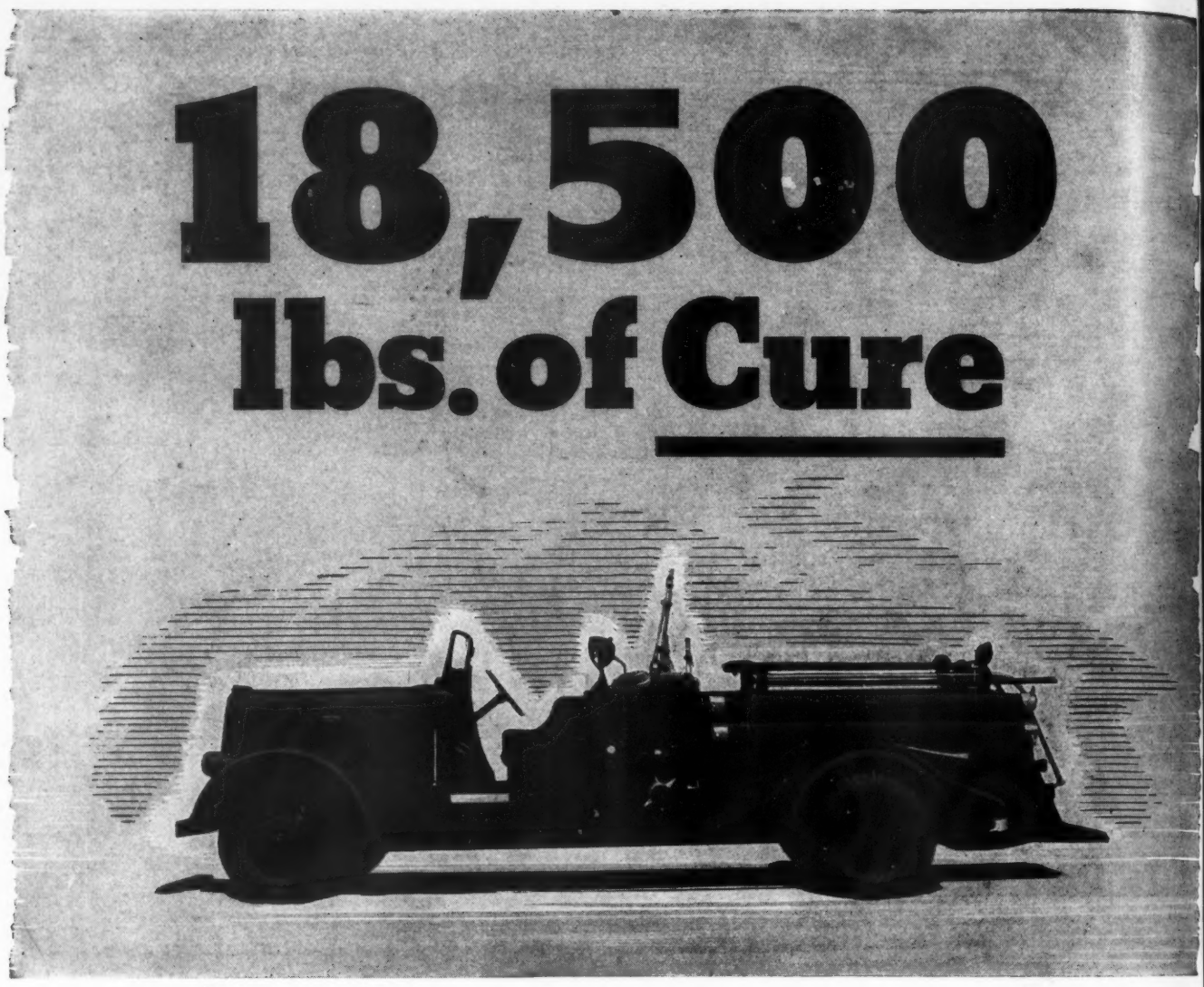
All that involves a lot of work. But you can greatly simplify it and feel more confidence in the result if you make use of the Manuals that PUBLIC WORKS has published for that purpose—The Manual of Water Works Equipment and Materials, The Manual of Sewage Disposal Equipment and Sewer Construction, and The Highway, Street and Airport Manual.

From these you can learn, with a minimum of time and trouble, what kinds of equipment are available for each purpose; the information is more complete and up to date than you can obtain in any other way; and it includes the names of all the leading manufacturers.

If you have these Manuals, be sure to use them.

If you do not have the 1943 editions, write today for information on how to obtain them. PUBLIC WORKS Magazine, 310 E. 45th St., New York 17, N. Y.

18,500 lbs. of Cure



QUICK FACTS

(About Model 150-T illustrated)

- Length: 25 feet 3 inches.
- Weight (empty): 15,000 lbs.
- Wheelbase: 192 inches.
- Turning Radius: 35 feet.
- Horsepower: 235.
- Pump: 1000 g.p.m., 2-stage Centrifugal, Rotary, optional.
- Booster Tank: 150-350 gallons.
- Hose Capacity: 450 feet ¾ inch Hose; 300 feet 1 inch Hose.

WE AGREE that in the fire field an ounce of prevention is worth a pound of cure. Pictured above, however, is the most effective nine and one-quarter tons of cure available to fire fighters. It is a model 150-T Ward LaFrance triple combination pumper recently delivered to the City of Minneapolis.

There is a Ward LaFrance pumper to meet the exact needs of any community. Let Ward LaFrance engineers help you to attain maximum protection for your community.

WARD LAFRANCE TRUCK DIVISION

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PUBLIC WORKS

Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 74 No. 12

A. PRESCOTT FOLWELL, Editor

DECEMBER CONTENTS

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THE WAR EMERGENCY

Return Chlorine Cylinders PROMPTLY

There is plenty of chlorine to meet the demands of all water and sewage treatment plants, but the cylinders for transporting it are the "bottle neck" of the supply. Although a large proportion of the cylinders in existence are in use for supplying the Armed forces, there are enough standard cylinders to take care of essential users if all of them are kept in circulation.

It is easy to set an empty cylinder aside and forget about it, but doing so under present conditions may mean delay in meeting a vital need.

This matter has been called to the attention of chlorine users several times, but apparently some are not sufficiently impressed with its importance, and Mathieson Alkali Works asks us to urge again the prompt return of every empty chlorine cylinder.

Conserving and Salvaging Paper

Emphasis at present is being placed by the Conservation and Salvage Divisions of WPB on the conservation and salvaging of paper. The reasons given are:

1. Paper is war material. It is used both to manufacture and deliver the weapons and supplies needed by our armed forces and those of our Allies.

2. The use of paper has been curtailed by government regulation. This has been necessary because of a shortage of manpower to cut the timber from which we get the pulp to produce paper.

3. The public can further help to guarantee sufficient supplies of paper for war production as well as for civilian needs by FIGHTING PAPER WASTE.

4. We must use all paper wisely. Because tremendous savings can be made especially in wrapping paper, the Government has asked merchants to avoid wrapping packages when possible. The public can cooperate by accepting packages unwrapped and by using their own shopping containers when possible.

Each and every community should cooperate through its waste collection service, Boy Scouts, schools, charitable organizations and other mediums in seeing that all waste paper of every kind reaches the junk dealers.

Higher Tin-Content Solders Available

The War Production Board in November issued General Preference Order M-43, as Amended, relaxing restrictions on the tin content of solders where it has been found that higher tin content is necessary. Previously this higher content could be used only upon the granting of appeal. But under the amended order, specific provisions permit higher tin content, in some cases above 21 per cent, for certain solders, thus reducing paper work. Careful survey has shown that the higher tin content solders permitted will actually result in a saving of tin.

The amended order also permits the reworking of block tin pipe.

Wartime Sewerage and Refuse Disposal

The Government Division, War Production Board, has recently published a pamphlet on "Sewerage and Refuse Disposal" which tells in clear language, without legal verbiage, how to apply for priority assistance for construction, for minor additions, and for purchase of capital equipment where no construction is involved. It gives the general provisions of "Preference Rating Order P-141-MRO" and of CMP Regulation 5A (June 4, 1943). Copies of this pamphlet can be obtained by application to the War Production Board, Government Division, Washington, D. C.

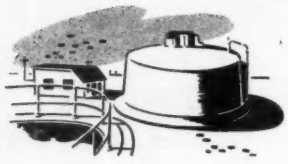
Planning Postwar Water and Sewage Equipment

Speaking before the Federation of Sewage Works Associations for the executive committee of the Manufacturers' Division, W. B. Marshall of the Chain Belt Co. stated that 52 leading manufacturers in the water and sewage works field had reported unanimously that designing engineers could specify their products as described in the latest prewar catalogs and be reasonably certain that they would be obtainable for immediate postwar work. It is expected that refinements and improvements will be made in new equipment, but these will not be such as to necessitate more than minor modifications, if any, in advance designs embodying such equipment.

Highway Postwar Plans Completed

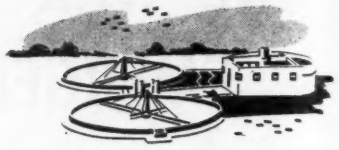
Federal aid for postwar highway planning is contemplated by several bills before Congress, in addition to the 60 million dollars already available on a 50-50 matching basis. So far only two states have actually submitted definite programs to the Public Roads Administration entitling them to receive a share of these federal aid funds—New York and Vermont, the former to receive $411,000 and the latter $46,550. However, the following state highway departments report plans completed: Florida, for 70 miles, mostly relocations of existing highways. Illinois, for 242 miles; with surveys made for 260 miles more. Kansas, for 117 miles, mostly grading, bridges and paving; with plans for 195 miles more delayed by lack of engineering personnel. Kentucky, for 110 miles; surveys for 232 mile under way. Maryland, for 48 miles and a large bridge. Massachusetts, for 20 miles and 18 bridges. Minnesota, for 600 miles of grading, 200 of surfacing and 40 bridges. Nevada, for 104 miles of road. New Jersey, plans for 16 miles completed and for 104 miles nearly so. Ohio, for reconstruction and grade separations estimated to cost $20,000,000. West Virginia, for approximately $20,000,000 worth of highways and bridges. Plans are reported under way but not completed by Alabama, California, Maine, New Hampshire and others.

5 POSSIBILITIES FOR YOUR POST-WAR MODERNIZATION PROGRAM



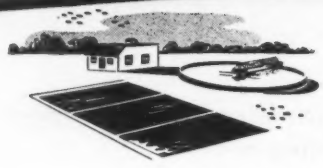
Are Grease and Grit Reducing Efficiency?

Grit removal in a Dorr Detritor and grease removal in a Dorrco Vacuator will improve operation of your entire plant!



Overloaded Low-Rate Trickling Filter Plant?

Conversion to Biofiltration will solve the problem—handle greater loads and produce better results!

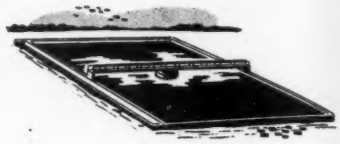


Need better Treatment?

Addition of a Dorrco Flocculator ahead of sedimentation will substantially raise both B.O.D. and suspended solids removals!

Overloaded Activated Sludge Plant?

Intermediate Biofiltration will relieve the load—and at reasonable cost!



Need Separate Sludge Digestion?

You can save tank costs by converting Imhoff tanks with Dorr Digester mechanisms for single• or two-stage digestion!

Now is the time to plan for tomorrow—to evaluate your needs and follow through to the blueprint stage. Only by careful and intelligent planning *now* can you insure your municipality of the benefits of modern sewage treatment in the immediate post-war period.

The five possibilities above are only a few of the many ways in which on overloaded or obsolete plant may be modernized—*and at minimum cost.* For there is an answer to every inadequate "problem plant" in Dorr Equipment.

If you are thinking in terms of modernization, it will pay you to get in touch with us. A letter to our nearest office will bring an immediate answer.

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PUBLIC WORKS Magazine . . . DECEMBER, 1943

VOL. 74. NO. 12

Progress in the improvement of N. Fourth St. One block has been completely finished, widened and repaved. Work is being continued in the background.

A Wartime Paving and Widening Project

By P. W. MAETZEL

Chief Engineer, City of Columbus, O.

Increased traffic necessitating widening of roadway and renewing the pavement, using old pavement as a base. To eliminate use of critical materials, new designs of storm sewer appurtenances were prepared.

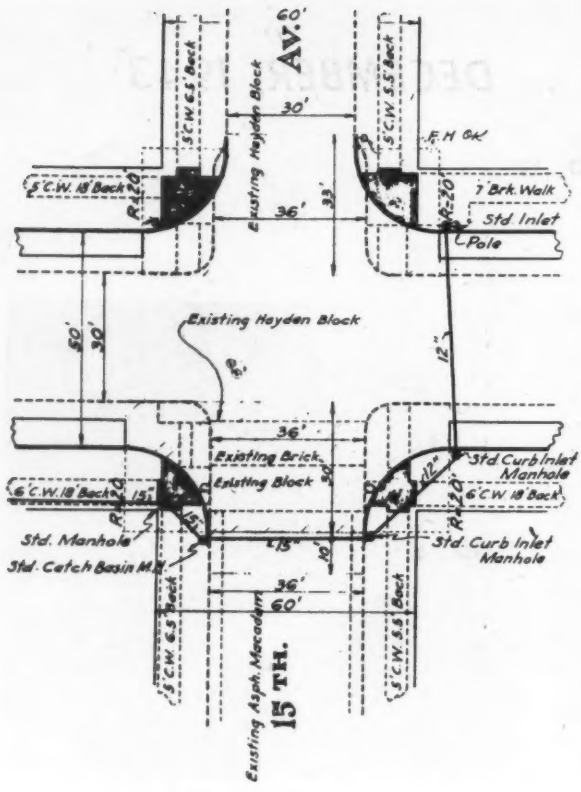
WAY back in 1892, even before the North Fourth Street District was annexed to the City of Columbus, a street improvement 30 feet wide was constructed on a right-of-way 80 feet wide, which was considered, and proved for many years to be, a first-class paving job. This street formed a portion of an important north-south artery, and included street car tracks located on each side of the paved portion in what constituted the sidewalk or berm portion.

A then popular type of paving unit, known as the Hayden Block, was used, the block being laid on a 10 inch, water-bound macadam base, and constituted a very substantial type of pavement. Just a word regarding the Hayden Block. These blocks measured approximately 5 inches wide, 5 inches deep and 11½ inches long, were hard burned vitrified clay and had two recessed pockets on the underside 3″ x 3″ x 3″ with a separating web. These pockets were filled with damp sand before laying and, when laid in place, the compacted sand would serve to trickle onto the base or cushion if any settlement or void occurred, thus preserving the surface of the pavement.

In 1910 this portion of North Fourth Street was included in an area annexed to the city and the maintenance of the pavement became a city problem.

With the increasing volume and type of traffic to which this pavement was subjected, the problem of

P. W. Maetzel
Chief Engineer



Details at a typical intersection.

maintenance increased to the point where Hayden Block were no longer available and the 30-foot width proved inadequate. Automobile traffic also found that the type of construction which carried street car tracks on the sidewalk areas had caused the construction of guttered intersections at the cross streets and many complaints about broken springs caused by these gutters were received.

Since this thoroughfare developed in importance generally, traffic demands for a more adequate pavement became evident because a large number of defense homes were built north of this location and the normal route in going to and from work for the dwellers in these homes involved the use of North Fourth Street.

A careful examination of the existing pavement caused the Division of Engineering and Construction to arrive at the conclusion that the old pavement, 30 feet in width, could be utilized as a base, the curb lines set back a matter of 10 feet on each side (since the street car tracks had now been abandoned and removed) with enlarged radii at the intersections and adequate storm drainage provided.

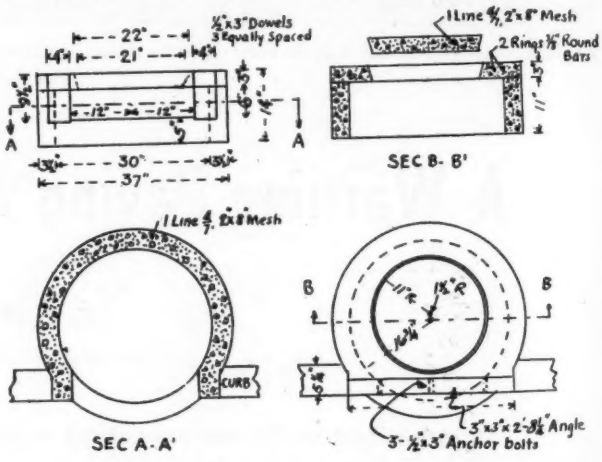
Such a project was submitted for W.P.A. consideration in 1940; but after considerable delay the federal agency failed to undertake this project.

During the year 1941 it was revived, but since W.P.A. was rapidly passing out of the picture, it was submitted to the City Council for approval as a contract job, with the abutting property being assessed a matter of $2.00 per front foot.

In the meantime, the Pearl Harbor incident involved us to the extent that some materials, originally standard in city construction, were on the critical list and some revisions were made to permit this work to go ahead. It became necessary to devise storm sewer appurtenances without the use of iron and steel, especially with respect to catch basins and manhole castings. The accompanying illustration shows the type of catch basin or curb inlet adopted as substitute.

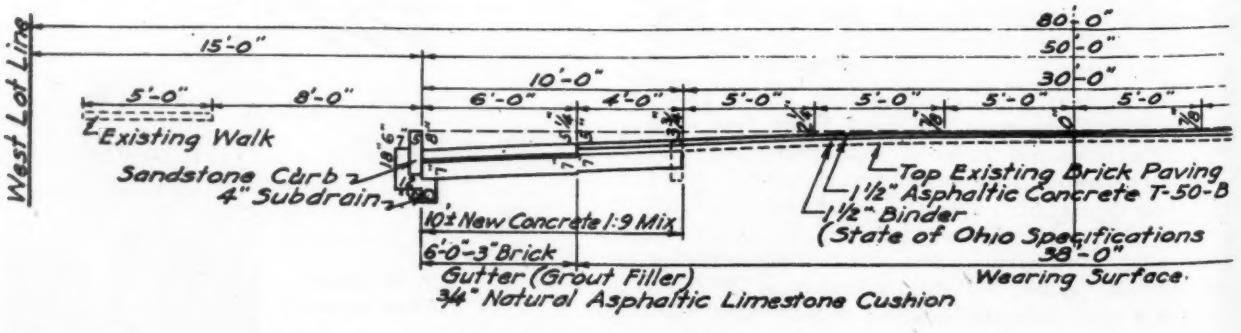
The length of this improvement is 5,504 feet and the contract consisted of 1,853 tons, variable thicknesses, of asphalt pavement, modified Ohio State Highway Department Type T-50; and 5,937 square yards of 3-inch vertical-fibre paving brick gutters, grout filled, the paving brick being furnished by the Hocking Valley Brick Company.

B. F. Patterson of Columbus was the contractor on this job, which cost $108,104.14, of which $19,821.28 was assessed against abutting property. Work was begun April 11, 1942 and completed December 2, 1942, which elapsed time included delays for bituminous materials approval and also unfavorable weather conditions.

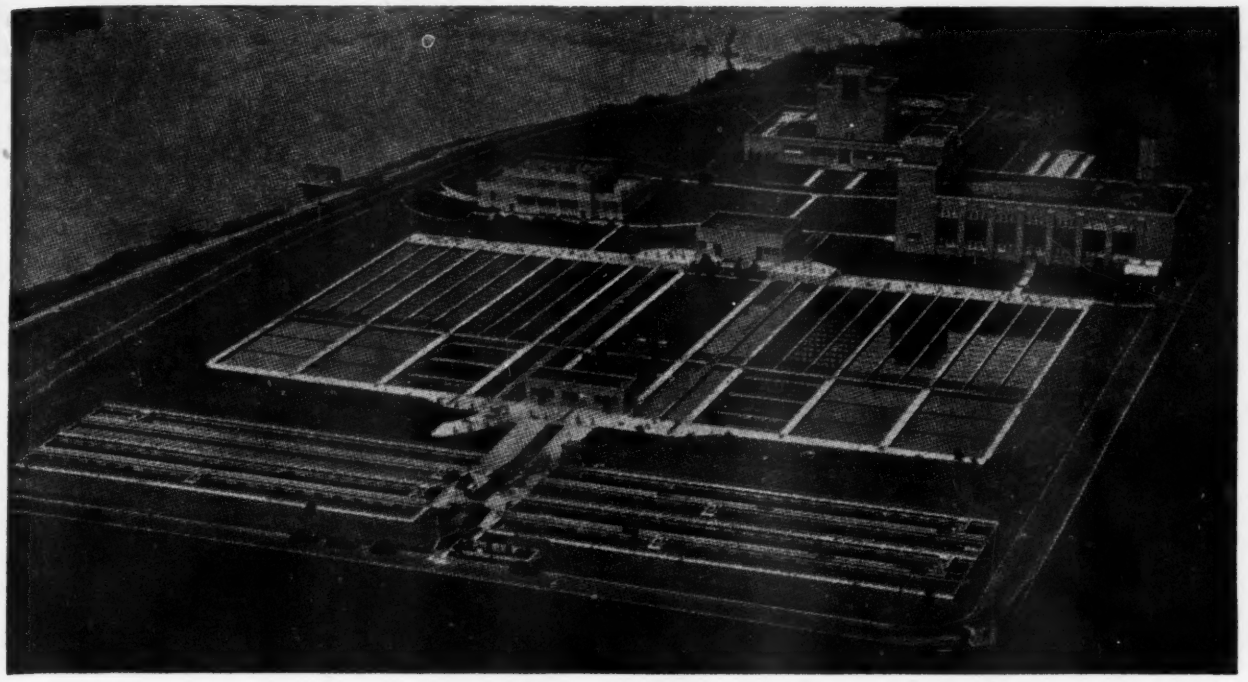


Precast concrete top for standard curb inlet or standard catchbasin.

For excavating and material handling, General Excavator Co. gasoline shovels and cranes were used. Sullivan air compressors, Parsons trenching machine and Koehring and Jaeger concrete mixers were used. A Caterpillar bulldozer and Buffalo-Springfield rollers were used. Mr. Patterson's asphalt plant is one manufactured by the East Iron and Machine Company.



Typical section of 50-foot roadway.



General view of the "Twin Cities" treatment plant, looking north or up the river.

Operating Results of the Minneapolis-St. Paul Sewage Treatment Plant

Analysis of record of four years' operation of this 134 m.g.d. plant. Costs and accomplishments of screens and grit chambers, settling tanks, effluent filters, concentration tanks and vacuum filters. Sale of sludge.

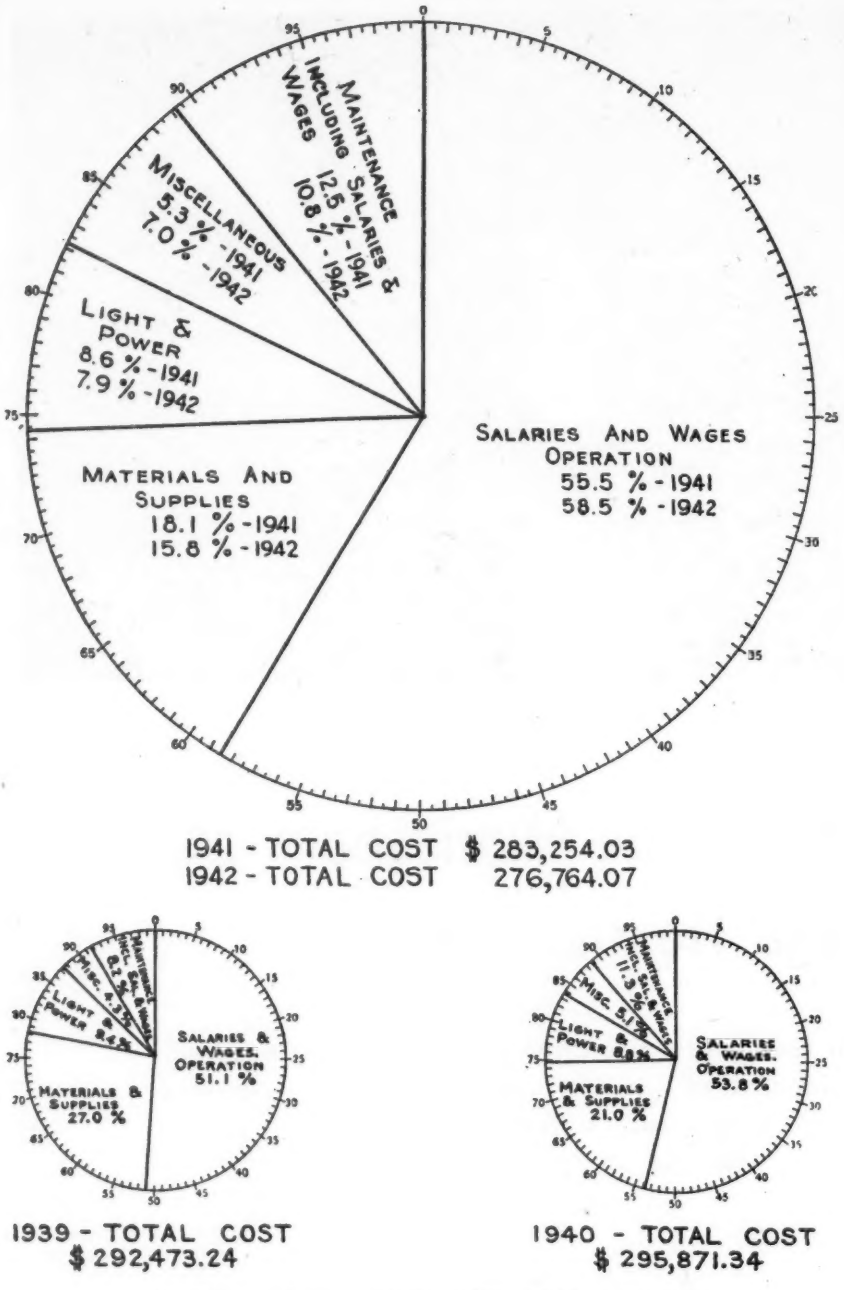
THE Minneapolis-St. Paul ("Twin Cities") sewage treatment plant, completed in 1938, receives the sewage from the metropolitan area of Minneapolis and St. Paul. It was designed for a flow of 134 mgd. In 1942 the sewage plant treated an average of 115 mgd. From the 40 billion gallons of sewage treated it removed 68 million pounds of sewage solids.

The plant is of the chemical-mechanical type. Treatment consists of screening and grit removal and two-hour sedimentation; and concentration, vacuum filtration and multiple-hearth incineration of sludge. When stream dilution conditions are unfavorable the treatment is supplemented with effluent filtration. flocculation without chemicals, and chemical treatment; with pre- and post-chlorination in summer. The plant includes 65 pumps and 350 motors varying in size up to 75 hp.

Sewage flow during 1942 averaged 140 gallons per person per day, with 0.338 pounds of suspended solids and 0.203 pounds of B.O.D. If B.O.D. is assumed at 0.163 pounds per capita—an average figure—the contributing population equivalent is 1,020,000 or 24% greater than the estimated population of 822,000 in 1942. Samples of sewage are collected on a 24-hour basis by automatic samplers which proportion the sample to the rate of flow.

Screen and Grit Chambers.—Screenings averaged 0.98 cu. ft. per million gallons, as compared with 1.00, 1.06 and 1.28 cu. ft. in 1941 and the two preceding years. The weight per cu. ft. for 1942 was 30.0 pounds, the total solids 16.7% and volatile solids 87.0%. Dry tons of screenings totalled 98, on a computed basis. A very coarse bar screen, having 6-inch openings, was removed in October 1941, since which time four 1-inch mechanically cleaned bar screens have given excellent service at a lower overall cost. Formerly the coarse screen preceded the 1-inch screens.

The quantity of grit removed averaged 6.4 cubic feet per million gallons, compared with 6.2, 6.2 and 8.88 cu. ft. in the three preceding years. During 1942, an average velocity of about 1.2 ft. per second was maintained in the grit chambers compared to 0.75 previously. The grit weighed 87.8 pounds per cubic foot, and total solids aggregated 87.7%, of which 6.9% were volatile. A total of 11,065 dry tons of grit were removed on a computed basis. The eight grit chambers are each 62'9" long and 12" wide; depth of flow varies from 4.5' to 9.0'. Grit is removed by



Analyses of costs, 1939, 1940, 1941 and 1942

scapers 8.0′ wide traveling at a speed of 8 ft. per minute, which deliver it to a hopper, whence it is elevated and washed by a 16-in. inclined screw conveyor. A belt conveyor discharges the grit.

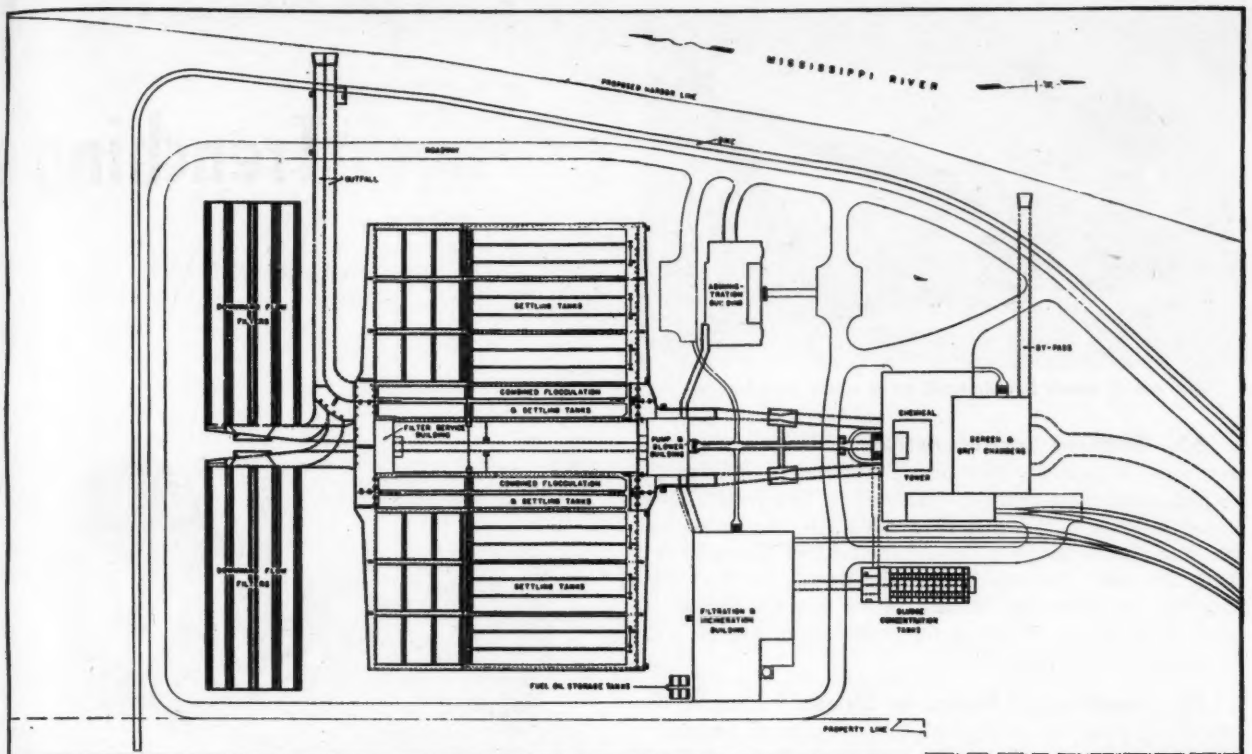
Settling Tanks.—There are six settling tanks, each 56 ft. wide, and 290 ft. long. The designed settling period is 2 hrs.; the 1942 flow permitted a detention period of about 3 hrs., but the actual average detention period was only 0.9 hour. The average removal of suspended solids during the year by the settling tanks was 64.3%, and of 5-day B.O.D., 40.1%. With a raw sewage B.O.D. of 175, the settled effluent contained 105 p.p.m.; the suspended solids were reduced from 290 to 100, exclusive of screenings and grit removed. These tanks are equipped with sludge collectors and skimming mechanisms. The latter are not used during the winter months, when their operation is more of a problem than hand skimming.

Effluent Filters.—These are of the downward flow, magnetite sand type. There are eight filters with a total filter area of 31,200 sq. ft. designed to operate at 3 gals. per sq. ft. per minute. These effluent filters were required, and operated, only 39 days during the year, filtering a total of 1,937 million gallons. With an average filter effluent with 150 p.p.m. 5-day B.O.D., 10 p.p.m. were removed; and with an average suspended solids influent of 99 p.p.m., 19 p.p.m. were removed.

Sludge.—Sludge from the settling tanks is pumped to concentration tanks where it is held for a maximum of 3 days. In addition to acting as storage to eliminate variations in solids contents, the

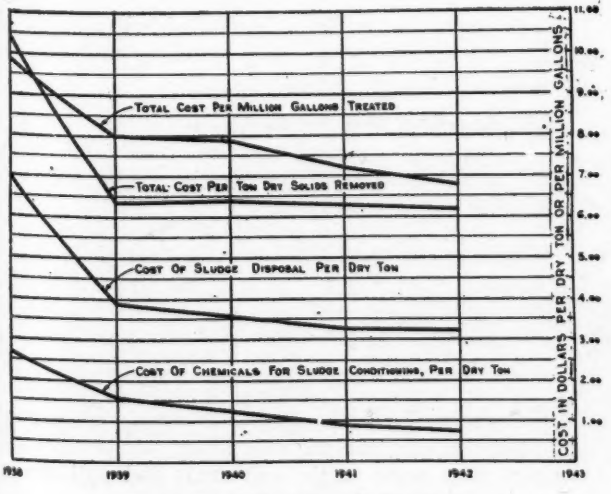
Comparison of Costs and Accomplishments for the Years 1938, 1939, 1940, 1941 and 1942

	1938	1939	1940	1941	1942
1. Total sewage treated during year, m.g.	14,826.1	36,705.3	38,037.6	39,286.7	40,465.7
2. Average sewage strength sus. solids, p.p.m.	240	285	300	315	290
3. Percentage removal of solids by plant	75.1	75.1	77.2	74.6	71.6
4. Tons of sludge solids removed (dry basis)	10,248	35,028.0	37,091.0	35,993.0	33,838.0
4a. Tons of dry solids removed	13,960	46,156.0	46,344.0	45,108	45,001.0
5. Cost of operation and maintenance	$146,131.37	$292,473.24	$295,871.34	$283,254.03	$276,764.07
6. Cost per million gallons treated	$9.90	$7.98	$7.85	$7.20	$6.85
7. Cost per ton of dry solids removed	$10.50	$6.35	$6.40	$6.30	$6.15
8. Total expenditures (operation and maintenance plus capitalized improvement changes, etc.)	$157,868.13	$301,538.98	$305,240.72	$305,982.18	$279,497.35
9. Cost per million gallons treated	$10.65	$8.20	$8.05	$7.80	$6.95
10. Cost per ton of dry solids removed	$11.30	$6.55	$6.60	$6.80	$6.20
Conditioning chemicals, % of dry weight of sewage solids:					
11. Ferric chloride	3.17	2.10	1.83	1.53	1.20
12. Lime	10.30	5.68	4.51	3.77	3.44
Removal of solids by plant:					
13. Screenings, c.f.	15,619	51,050	40,203	38,410	39,018
14. Grit, c.f.	91,769	329,335	241,109	247,708	273,655
15. Filter cake produced, tons	28,793.1	107,835.8	112,854.7	108,912.4	99,654.0



MINNEAPOLIS-ST. PAUL SANITARY DISTRICT TREATMENT PLANT LAYOUT

solids concentration of the sludge was increased from 8.61% to 9.63%. Sludge is pumped once each shift and special effort is made to draw as concentrated sludge as possible. The pH of the raw sludge averaged 6.2, with daily variations from 5.6 to 7.4; the pH of the thickened sludge averaged 6.0 and ranged from 5.4 to 7.3. Values of pH below 5.4 or 5.5 indicate a septic condition, with the sludge becoming more difficult to filter. The volatile solids of the raw sludge averaged 63.8%, and of the thickened sludge 62.5%. Average daily sludge production was 308,000 gallons; average daily sludge supernatant liquor return was 87,800 gallons. The grease content of the raw and the concentrated sludges (by the ethyl ether method) averaged 13.3% of the dry solids; the grease content of the filter cake averaged 10.5% on a dry basis. If soaps are included, the filter cake contained 14.5% grease.



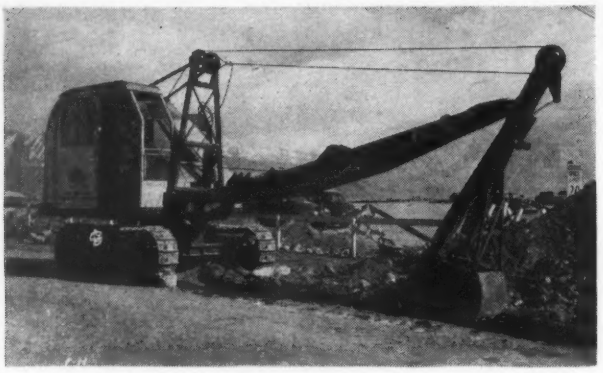
Comparison of unit costs by years.

Vacuum Filtration.—A total of 79.8 million gallons of concentrated sludge was filtered during the year. The average moisture content of the filter cake was 66.3%, and the average volatile content 59.7%. The quantity of ferric chloride used for conditioning was 1.20% of the weight of the dry sewage solids; lime used was 3.44% on a CaO basis. These figures were markedly below the preceding year. The average life of filter cloth was increased to 493 hours from 355 hours in 1941 and 326 hours in 1940. The average filter rate was reduced from 5.50 pounds of dry solids per sq. ft. per hour to 3.40, as a means of saving chemicals. A factor in prolonging the life of the filter cloth was the use of hydrochloric acid containing aniline oil as an inhibitor. With an 0.7% HC1 solution, 2% aniline oil reduced corrosion 44%; with a 2% HC1 solution, 1% aniline oil reduced corrosion 87%; and with 5% HC1, 2% of aniline oil reduced corrosion nearly 97%. The total quantity of filter cake produced was 99,654 tons.

Sludge Disposal.—More sludge was sold for fertilizer than last year, this amounting to 6,867 wet tons (2,211 tons, dry basis). A total of 92,786 tons of filter cake (31,340 tons of dry solids) was incinerated, requiring 8.8 kw. of electricity and 2.15 gallons of fuel oil per dry ton. The fuel oil is required for starting furnaces, taking them out of operation, and holding temperatures between operating periods. The cost of operation and maintenance for the entire sludge disposal process amounted to $3.27 per ton, the same as in 1941, or $322 per day.

Sewage Characteristics.—The average pH of the sewage was 7.5, ranging from 7.0 to 8.1. The average temperature was 60° F, ranging from 46° F on March 20 to 69° F in July, August and September. Average temperature of the plant effluent was 60° F, with a low of 47° F.

(Continued on page 32)



A P & H trench hoe at work on a water pipe trench.

Trenching a

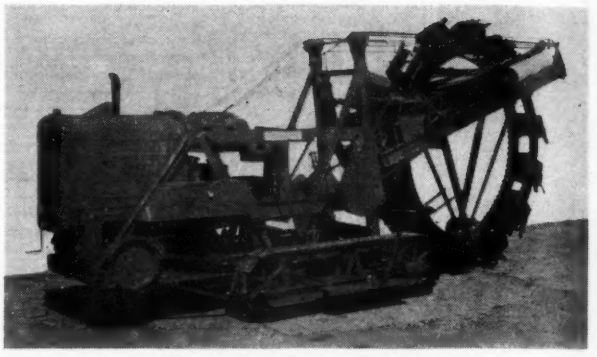
52. General Considerations.—Factors concerning sizes of water mains and the methods of computing flow in them were considered in the June, 1943, issue of PUBLIC WORKS. In general, the mains should be sufficiently large to meet anticipated demand for both fire and domestic purposes. Mains to which hydrants are connected should be at least 6 inches in size. A pressure of 50 to 60 pounds per square inch is generally desirable.

53. Location of Mains in Street.—There is no standard practice in regard to the location of mains in streets. Many subsurface structures may interfere with a general policy—sanitary and storm sewers, gas and electrical conduits, etc. However, in most cities the adoption of a fixed policy is possible and desirable, even though it must be modified occasionally. A standard system of locating water mains—so many feet from the north side of the street, or the east side—usually can and should be adopted and followed to the maximum extent possible. Where there is space between the sidewalk and the curb, water mains may be laid there.

Where streets are wide and hard surfaced, it may be very little more expensive to use the dual main system—a large main on one side of the street and on the other one only large enough to serve the residences it passes, with connections between the two every block or so. Cuts in the pavement for connections and repairs are eliminated by this plan.

54. Depth of Pipe Lines.—The depth to which frost penetrates is the most important factor in determining how deep water pipe should be placed. In the northern part of the United States, a cover of about 6 feet is normal. Farther south, in the less cold sections, the cover is 4½ or 5 feet. In the far south, cover is normally only 2 or 3 feet, unless protection from traffic impact is a factor. The load of fill on a water pipe is not important, since it is never sufficient to cause failure of a pipe properly bedded, as in the case of sewers. Also water pipe does not have to be laid on a uniform grade, as in the case of sewers, and can follow the general contour of the ground. However high points in lines should generally be avoided, at least markedly high points, due to the tendency of air entrained in the water to collect in these high points and interfere with or obstruct the flow of water through the pipe.

55. Alignment.—Water pipe also differs from sewers in that it is not necessary to maintain a straight line. In fact a curve is preferable to an elbow, as there is less loss of velocity in passing around a curve. On the other hand a water line should not wiggle and waggle in bends and curves. In general, lines should follow streets and, as previously stated, be located at a uniform distance from a curb or building line.



Wheel type trench excavator.

56. Trenching and Excavation.—Methods of trenching have already been generally discussed, but there are some procedures peculiar to water main trenching. The excavated surface material, whether pavement or sod, is best thrown to that side of the trench on which the pipe will be unloaded and stored. The remainder of the excavated material is placed on the opposite side of the trench so that the pipe will not have to be lifted over it for placing in the trench. Cast iron pipe is very heavy, especially the larger sizes, and every advantage for providing easy handling should be obtained.

The width of the trench is usually 12 to 18 inches greater than the outside diameter of the pipe. With bell-and-spigot pipe, a bell hole must be dug at each joint. The bell-hole is usually 6 ins. deeper and 6 or 8 inches wider on each side than the remainder of the trench. The purpose of this enlarged section, which extends about 36 inches in front of the joint is to provide the necessary space for pouring and calking of the joint.

57. Bedding the Pipe.—Even though cast iron pipe is extremely rugged and will withstand heavy loads, careful bedding of the pipe on a firm and even foundation over its entire length is a vital necessity. Rock or stones should be entirely removed for a depth of at least 6 ins. below the pipe, and also for 6 ins. on the sides. The space under the pipe should be filled to grade with sand or loam, and the same material should be used to fill firmly the space between the pipe and rocks or stones at the sides of the trench. In swampy areas or elsewhere that the soil is very soft, the pipe should be supported on a timber grid or on piles driven into the ground. If this is not done, the pipe may settle in the soft areas and pull one or more joints open. If this occurs in a swamp, the

laying Water Pipe

Determining location, depth and alignment. Excavations and bedding. Unloading and cleaning pipe. Placing valves and hydrants. Testing and sterilizing mains. Concluded from the October issue.

resulting leak may be very difficult to discover. Wooden blocks are often used for supporting pipe 16 ins. or more in diameter, even when the trench bottom is firm ground.

58. Specifications and Inspections.—In the purchase of small orders of cast iron pipe, reliance must be placed on the honesty and good faith of the manufacturer. Practically all American manufacturers follow standard Federal or AWWA specifications and such pipe may be purchased with confidence. Foreign pipe, pipe of uncertain origin and second-hand pipe should be bought only after skilled inspection. There are a number of engineering firms which specialize in inspecting pipe and their fees are very small when compared with the money or trouble they may save. They should also be utilized for inspecting large orders of pipe to see that the pipe is of the proper strength, fully coated and meets other items of the specifications, including cleaning, testing, coating, weighing, and checking for blisters, sand holes and other defects.

Inspections in the field are limited in scope, but should include detection of damaged or incomplete coatings or linings, cracks, and the condition of the interior of the pipe, specially as regards cleanliness. Cracks can usually be detected by striking it with a steel hammer, when it should sound a clear ring.

When reinforced concrete or transite pipe is used, specifications and requirements as to strength and tightness should be rigid, and the completed pipe line be tested so as adequately to insure that they have been met.

Laying cast iron pipe at Tampa, Fla.

As previously stated, all laying should be done according to specifications, whether the work is carried out by contract or by force account. Defects in laying procedures, in bedding the pipe or in making the joints are just as annoying and costly when done by city employees as when done by a contractor; and they require just as much costly after-maintenance.

59. Unloading and Handling.—Pipe may be shipped by railroad, by truck or by water. A crane or derrick is helpful or necessary in unloading pipe from a railroad car, though inclined skids may sometimes be used. The crane or derrick permits quick and safe handling of the pipe and positive placement in the desired position on a truck for hauling to the site of the work. In unloading from a truck, inclined skids or similar devices may be used. Pipe should never be dropped onto pavement or hard ground. Old rubber tires placed on the ground were formerly used as pipe shock absorbers; bags of hay, tightly packed, are good war-time substitutes.

In order to save a great deal of annoying and costly work, the pipe should be placed as precisely as possible along that portion of the trench where it is to be used. It is generally placed on the side of the street opposite to the excavation. The bells should face in the direction in which the work is to proceed (on appreciable grades, bells should always face up-hill) and the pipe should be so spaced that no lateral movement will be needed in moving them to the trench. The aim should be to so place each section of the pipe that, as nearly as possible, the only movement needed will be to roll it to the side of the trench and lower it into place.

Smaller pipe is lowered into the trench by 2 or more men using ropes passed around the pipe. One end of each rope is fastened to some firm object or is anchored by the men standing on it, while by paying out the other end, the movement of the pipe is controlled. A small power shovel or crane can handle even large pipe very efficiently and quickly and is much safer than rope handling for all but very small pipe. A 16-ft. length of 6-inch cast-iron pipe weighs 485 to 560 pounds, and a 12-ft. length from 370 to 430 pounds, depending on the pressure it is designed to handle. Generally 3 or 4 men will be required to handle even the

lightest of these. Transite pipe is much lighter, and larger sizes can be handled by hand.

After the pipe has been lowered into the trench, the spigot end must be accurately inserted into the bell of the pipe already laid. Two or three men standing astride of the trench can lift a small pipe by means of ropes passed around it and can center the spigot into the bell preliminary to jointing.

When sheeting and bracing are in place, the pipe must be lowered into the trench at some point where the cross-braces are not in place and then moved horizontally to the proper position; this moving can be done by means of rope, as in centering, swinging it forward a few feet at a time. Skids, rollers, or some other similar devices are effective in facilitating the movement of the pipe in the trench, especially in the case of heavy pipe. Where the banks are sound, one brace on each ranger may be removed while a pipe is being lowered, and immediately replaced. Or the pipe can be lowered in a more or less nearly vertical position and the lower end pulled under the bottom brace as the upper end is lowered.

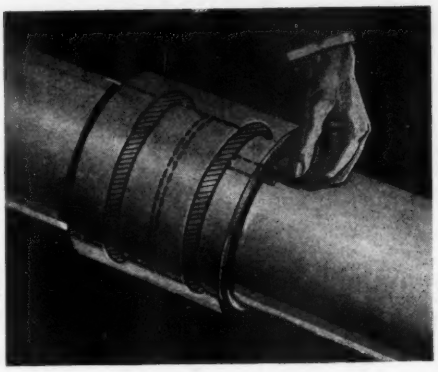
60. Cleaning the Pipe.—Although the pipe is theoretically clean when it leaves the factory, it is particularly subject to contamination in shipment; whether in railroad cars or in trucks, handling and the normal hazards of travel may result in dirty or greasy pipes or interior sections of them. The pipe is often temporarily stored in a gutter or ditch or other place where dirt may wash in it, where animals may enter, or where children may deposit trash or junk within the pipes. In the actual laying, it is often necessary to handle the pipe in muddy places. As a result of all these opportunities, water pipe is almost universally contaminated prior to laying. To prevent such contamination is almost impossible. Therefore any water pipe laying project should include specific provision for cleaning all pipe just prior to laying.

There is no specific recognized method of cleaning. A strong stream from a hose may be used to flush out the pipe, but mere flushing is not enough. Each pipe should be swabbed with a stiff brush or a close-fitting and clean mop (such as a bag filled with excelsior) between washings or flushings, and the brush or mop should pass entirely through each section of the pipe.

Though it is difficult to verify the belief, it is believed that carelessness in allowing water pipe to become dirty prior to or in the process of laying and the neglect by the contractors of sound cleaning precautions, were the most important causes of non-potable water samples reported in Army installations during the past 2½ years.

Extra care to insure that pipe is thoroughly cleaned before laying will greatly reduce the number of unsatisfactory water samples over the following 3 to 6 months and will often pay for itself in lessened chlorine need for main sterilization.

61. Placing and Maintaining Valves.—On all mains and submains, valves should be placed at intervals not to exceed 500 to 1000 feet. At intersections of two lines, valves should be placed on both pipes on both sides of the intersection. In general, valves should be so placed that any section of pipe can be shut off without interrupting the flow through the rest of the system. Valves are placed in valve boxes, or, in the case of very large valves, in special manholes. These should be so referenced by permanent markings, as by distances and compass bearings or angles, to trees, buildings, curbs or other permanent objects, as to insure that the valve can be found quickly in case of need, day or night, or when snow is on the ground.



"Simplex" coupling for laying Transite pipe. A thin steel blade, slipped under the lip of the sleeve, checks the position of the rubber ring.

To insure that they are in good working order, all valves should be operated at least twice a year. A record should be kept of the number of turns required to open or close a valve, and each valve should be checked to note if it can be fully opened or closed.

Whenever any kind of repair is needed, the packing in the valve should be replaced.

62. Placing and Maintaining Hydrants.—Hydrants are generally located at or near street intersections, and when the blocks are long, at intermediate points also. The National Board of Fire Underwriters recommends spacing hydrants 200 to 300 feet apart, depending on the fire demand. The hydrant is usually best placed about 18 ins. back from the curb line; at intersections it should be placed near the intersection but on the street of least traffic. Fire hydrants should be inspected about every three months, except that in cold weather important hydrants should be checked three or four times a month. It is especially important in placing a hydrant to provide fully adequate drainage for the water that remains in the hydrant barrel after every use. This is usually done by constructing a seep area with broken stone or gravel. A hydrant drain should never be connected to a sanitary sewer, as sewage might back up into the hydrant, and if the hydrant were then opened when water pressure was off, the water supply would be contaminated.

63. Location of Pipes for Health Protection.—Water pipes are theoretically tight and theoretically are always under pressure, but there may be cracks or leaks in some pipe, and some joints leak. Also every now and then a break in a main occurs, or for some other reason the water is cut off. As the water flows out from the lower end of a pipe or a portion of a distribution system, a negative pressure or vacuum occurs in the upper end. When such a vacuum is present, ground water or any other liquid may be drawn into the water pipe through a crack or leaky joint and contaminate the water. For these reasons, water pipes should not be placed in the same trench with, or alongside of a sewer; locations near cesspools or septic tank outlets should be avoided. Any other location that places the water line in close contact with any potential source of infection should be given the utmost consideration before it is adopted.

64. Jointing Water Pipe.—The process of placing the pipe and preparing it for jointing has already been described. Joints may be made with lead, or with other jointing compounds, or mechanical or factory-made type joints may be used. No matter what type of jointing is used, the prime requisite is that it be used properly and in accordance with the specifications in order to insure a good job. When lead or other melted

material is used, the trench must be dry and the pipe also, or a good joint cannot be obtained. A jointer should be used to hold the melted material in the joint and all of the material necessary to make the joint should be poured at one time. When mineralead, hydrotite or leadite is used, the manufacturer's instruction should be followed precisely, and the same is necessary with mechanical joints, no matter what kind.

65. Testing for Leaks; Allowable Leakage.—Every water pipe line should be tested for leakage before it is covered up. It is convenient to test each section between valves, the valves being closed. There are a number of ways of measuring the leakage. One convenient way is to tap the line on either side of the valve between the new pipe line and the rest of the system, and connect the taps with a line of small pipe in which a 5/8-inch meter is inserted. The new section of the line is filled and the valve is closed. Water can then enter the new section only by passing through the meter, which will register the flow representing the loss by leakage. Except in the case of some of the jointing materials other than lead, which require 24 hours or so to attain maximum tightness, leakage tests should be made promptly. The pressure used in testing should be, if possible, a little greater than that the pipe will normally carry.

The amount of leakage should not exceed 200 gallons per day per inch of diameter of pipe per mile of pipe. For a 10-inch pipe, the leakage should **not** be more than 2000 gallons per day per mile of pipe. If the section being tested is 880 feet or 1/6 mile long, the loss should not exceed $2000 \div 6 = 333$ gallons per day. A 6-inch pipe should not lose by leakage more than 1200 gallons per day for each mile of pipe.

In order to protect the pipe from excessive temperature stresses and from tendencies to move at bends and curves, the line is usually covered at once except for the joint sections which are left uncovered for inspection.

66. Sterilizing Mains.—The need for cleaning the pipe and keeping it clean has already been explained. However, before any pipe is put into use as a part of a water distribution system, it should be sterilized. The least effective way of doing this, but the easiest, is to place a small amount of hypochlorite of lime or bleaching powder in each length of pipe as it is laid. The amount needed depends on the size of the pipe and also on the strength of the chemical needed, and is given approximately below. The manufacturers of chlorine feeding apparatus generally have arrangements for lending or renting "main sterilizers"; or the State Board of Health will give detailed directions. When bleaching powder or hypochlorite of lime is used, the following amounts will be required per 100 feet of pipe.

Dresser mechanical joint.

Excavation of trench, laying and joining pipe and backfilling can be handled rapidly and efficiently on production line methods.

Ounces Required

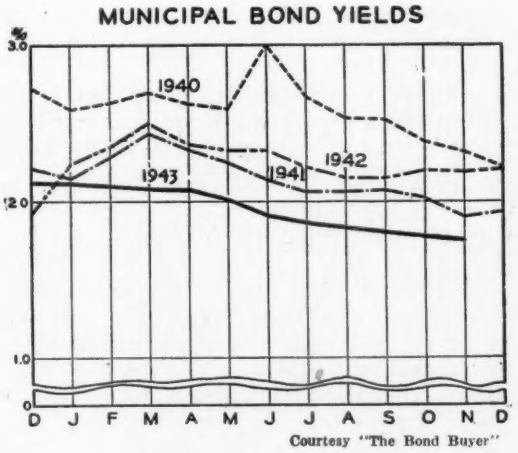
Size of Pipe	*Bleach (25% chlorine)*	*HTH or Perchloron (65% chlorine)*
4	1½	¾
6	3¾	1½
8	6	3
10	10½	3¾
12	15	6
16	27	10½

67. Covering the Pipe.—Earth free from stones should be packed under the pipe and compacted around it, at least as far up as the top of the pipe. Above this level, less care is necessary. However the dirt immediately over the top of the pipe should be free from stone. In areas where much of the excavated material is boulders or broken rock, dirt for filling under, around and at least 6 ins. over the pipe may have to be hauled in.

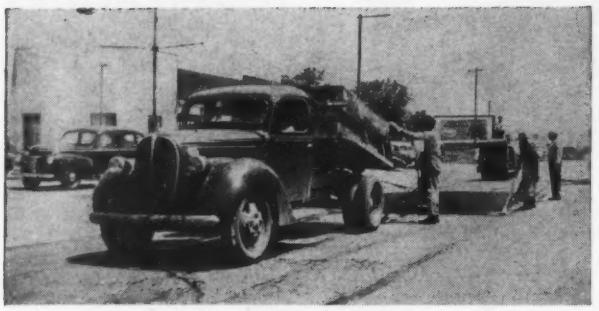
Tamping or compacting of backfilling and replacement of pavement have already been discussed.

Municipal Bond Yields

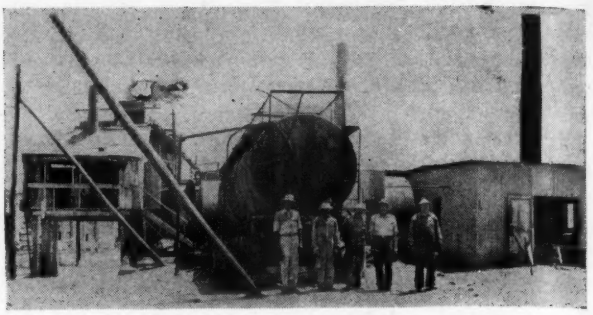
The *Bond Buyer* publishes each month a chart showing the average bond yields of 20 of the larger cities for the preceding month. Their chart for November 1 shows a continuous decline in yield (increase in prices received) since March 1942. That month the yield was about 2.5%; the index on November 1 was 1.69%. The previous all-time low was 1.90% for November 1941.



Courtesy "The Bond Buyer"



Asphalt street patching crew.



Oklahoma City's asphalt plant.

Low-Cost Asphalt Maintenance Of Hard-Surface Streets

By RALPH LEE
City Engineer of Oklahoma City, Okla.

Municipal asphalt plant helps keep down cost of maintaining 325 miles of paved streets. Sheet asphalt mixture commonly used; 20,000 tons the first year of the asphalt plant.

OKLAHOMA CITY, OKLAHOMA, has 325 miles of paved streets, of which approximately 8% are concrete, and 92% are asphalt surface on all types of base courses, some of which have been down approximately 40 years.

In 1935 the city purchased its own municipal asphalt plant for the repair and upkeep of hard-surface streets. This has proved to be a wise investment and has resulted in substantial reduction in maintenance expenses. The plant purchased was a used stationary hot-mix type. While in some respects it is now obsolete in comparison with modern plants, still it has given very satisfactory service. The plant, which has a capacity of about 100 tons per 8-hour day, was made by the Iroquois Barber Asphalt Paving Company; the steam boiler was made by the Lucey Boiler Works, and the dust collector is home-made from salvaged materials. The asphalt roller used on the street, which was made by the Erie Roller Company in 1927, weighs 8½ tons and has a Waukesha motor for power.

During normal operations, one foreman, one steam engineer, two mixer men and two laborers are employed at the plant. The street crew doing surfacing or patch work consists of one foreman, one rollerman, four asphalt rakers and four laborers, with three trucks hauling asphalt from the plant to the point of operation.

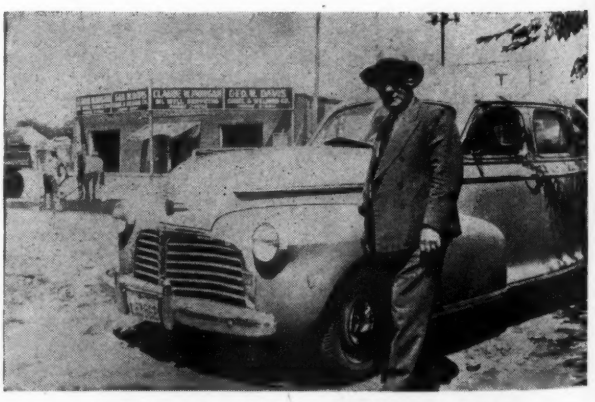
While different mixtures are sometimes specified for particular jobs, a sheet asphalt mixture is generally used for patch work and resurfacing. This mixture is composed of 75% river sand, 15% mineral filler and 10% 50-60 penetration asphalt cement. The mix leaves the plant at approximately 325° F. and is laid on the street at 275° F. This mix stays put very well, and while in some places we have as much as 8 inches depth, there is practically no shifting or corrugation. At the beginning of each fiscal year the city invites competitive bids and then contracts are let for furnishing the asphalt, mineral filler and sand to the plant for the ensuing year.

To prepare the base for sheet asphalt, it is cleaned of all loose particles and free of moisture; then, just as the asphalt is laid, the surface is sprinkled with hot asphalt cement. A hot-mix, hot-laid type of asphalt is particularly suited to patch work and repair of all types of paved city streets in this locality, since it can be used satisfactorily the year round in the prevailing temperatures. It can be laid successfully in the winter months and, once laid, is little affected by rain or frost. It bonds to various types of pavement and can be laid in thin skin patches with a minimum of peeling.

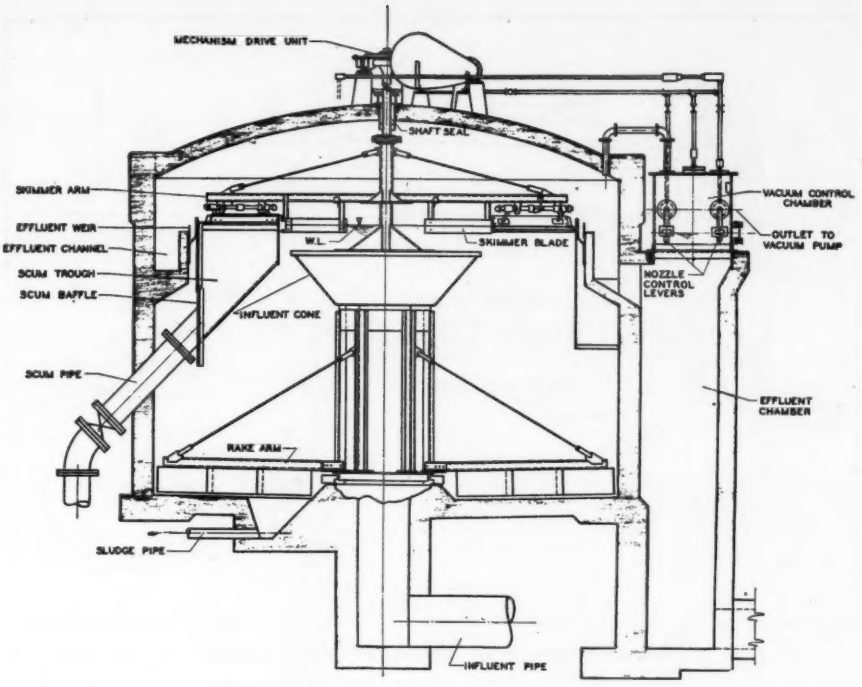
When WPA ceased their operation on Municipal Airport No. 2 it was lacking the top on extensions of two runways totaling about 17,000 sq yds. We completed the top on this 10″ limestone macadam base with our asphalt plant crew, using a mix of 7% asphalt cement, 90 penetration, 9% mineral filler, 24% sand and 60% limestone rock chips passing ¼ inch screen.

In the first year of operation, the Oklahoma City municipal asphalt plant produced 20,000 tons of asphalt at an average cost of $4.57 per ton, which includes all overhead and plant depreciation charges. Through experience and by careful supervision of operations, the cost has been reduced, and during the

(Continued on page 52)



Ralph Lee, City Engineer of Oklahoma City.



Sectional elevation of Dorrco "Vacuator."

Recovery of Grease from Sewage

Effectiveness of grease interceptors. Amount of grease in sewage and packinghouse wastes and practicability of recovering it. From Report of Committee on Sewage Disposal, American Public Health Ass'n.

IN World War I grease was a problem in most army cantonments. In World War II, with the cooperation of the War Department, the Iowa Institute of Hydraulic Research, and various manufacturers, the problem was approached on the basis of adequate grease traps or interceptors installed at the source, i.e., the sink. The efficiency of various devices or arrangement of baffling was tested on a definite basis.

F. M. Dawson states (1) that "grease must be separated in a liquid state, since sufficient time is not available for cooling, and also since the temperature of the interceptor is almost always, when in operation, above the congealing temperature of the grease. The separation is obtained by securing a proper reduction in velocity of the entering water by use of baffling and by preventing the occurrence of large scale turbulence." Well-designed interceptors will maintain an average efficiency of 90 per cent for a flow rate equal to 1 gal. per min. for each 1.0 to 1.5 gal. of interceptor capacity. The grease-retaining capacity should be equal, in pounds, to twice the flow rate in gallons per minute. "Regular cleaning, at least once a week, is of prime importance."

The general test procedure consists of running hot water mixed with a definite amount of pork lard through a grease trap (or so-called grease interceptor) at a selected rate of flow, for a number of two-minute periods. The grease leaving the interceptor is collected, dewatered, and weighed. The discharge of water in two-minute periods is continued until the grease-retaining efficiency of the interceptor drops very appreciably. The efficiency is calculated as follows:—

$$\text{Efficiency} = \frac{Gi}{Gt} \times 100$$

Where Gt = Total grease in pounds added to the interceptor since start of run

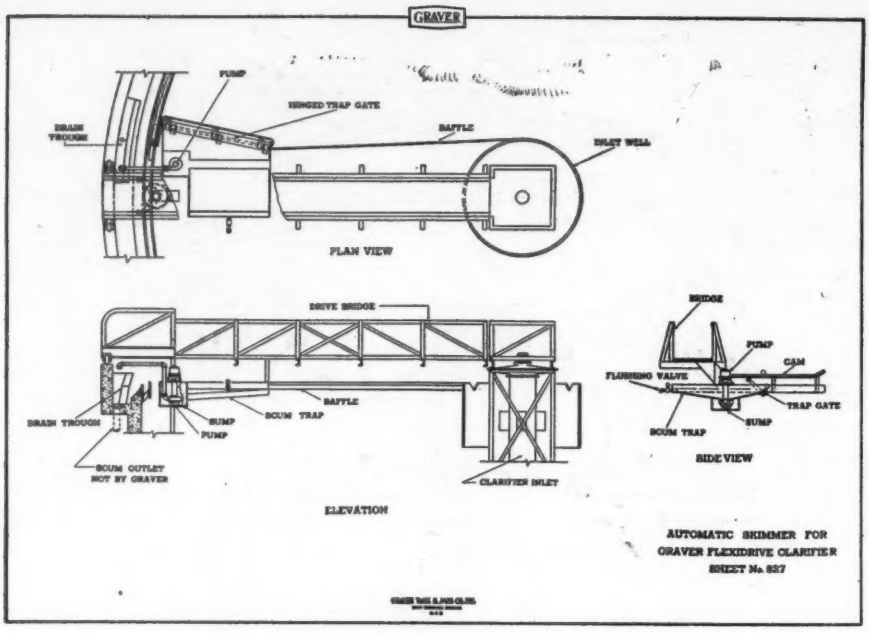
Gi = Gt minus the total grease in pounds that left the interceptor since the start of the run.

The efficiency so calculated is plotted against the total grease in the interceptor (Gi).

Pork lard is added to the hot water at a concentration of one pound for five gallons of water, with the mixture at a temperature of 150 deg. F. Before starting any series of runs, the interceptor is first filled with water at 150 deg. F. The two-minute discharges are then made as promptly as possible.

The resulting specifications have been adapted to the needs of the War and Navy Departments for apparatus purchased. For civilian use, ceramic traps are said to be available from various manufacturers.

In Chicago, the Chicago Section of the American Chemical Society (of which R. C. Newton of Swift & Co. is Chairman) formed a committee which has been active in preparation of recommendations for WPB on industrial fat recovery. On this Committee



Automatic skimmer for Graver "Flexidrive" clarifier.

are representatives from various large industries as well as The Sanitary District of Chicago. The recovery of fats at the source has been vigorously stimulated not only in the packinghouses but in soy bean extraction plants, vegetable oil refineries, soap making plants, and others.

Grease from Packinghouses. For the packinghouse industry E. N. Mortenson (2) suggests a procedure to improve the grease catch. He recommends that all fats to be reclaimed be kept out of the sewers in the first place, because a more valuable product is obtained with less effort. Two main types of wastes are handled, which contain fats and grease. The first results from the slaughter operations and washing of raw product before processing. Such fatty matter is non-emulsified and will float. Recovery can be largely had in detention periods of 5 to 10 minutes with flow velocities of 3 to 6 ft. per min. The settling solids must be promptly removed.

The second type carries fatty matter originating in the processing of by-products, cooking, rendering, etc. A large part of the grease is emulsified. The settling solids are relatively low in amount. A detention period of 1 to 2 hours, with flow velocities of 0.25 to 0.50 ft. per min. is about the maximum which can be provided. Suggestions are made on operation, analyzing the sample, and determining the recoverable fat loss. Mortenson states the loss of recoverable fat can be kept to 0.1 lb. per 1,000 lb. live weight for both slaughtering and processing if adequate recovering basins are well operated.

If the wastes are combined, the detention period on average flow is about one hour, with a velocity of one ft. per min. or less.

Grease from Sewage Works. In the sewage works of the Sanitary District, two sources of material carrying grease were investigated. At the Racine Avenue Pumping Station (through which a large portion of the wastes of Packingtown pass) in 1942-1943 an average of about 1,920 lb. per day of skimmings has been caught. The maximum month was about double this rate. Such skimmings average about 40 per cent water and 60 per cent solids, of which 37 per cent is ether extract. Thus 1,920 lb. of skimmings per day yielded about 425 lb. as grease in the laboratory. At the Southwest Works (which receives practically all the wastes of Packingtown) an average of about 14,000 lb. per day of scum accumulates which has an ether extract content of about 50 per cent of the wet weight. Of this about 15 per cent is unsaponifiable. The catch ranges from 5,000 to 20,000 lb. per day. For these skimmings a refiner of grease pays 0.55 cent per pound, f.o.b. trucks at the works, for a period of six months.

In New York City, the skimmings from four of its sewage treatment works have been sold at 0.8 cent per pound, f.o.b. the works, in containers furnished by the buyer. The estimated output is about 106,000 lb. per month. About 75 to 80 per cent of the dry weight of the scum is ether soluble, of which 4.6 per cent is unsaponifiable.

At Denver, the skimmings yield 50 per cent saponifiable fat, which contains 7½ per cent glycerine (3). Owing to war conditions the grease has increased from 1,000 to 2,500 lb. per day. This is sold to a rendering plant (4). At Des Moines, grease is rendered at the sewage works, using sewage gas for fuel (4). From 400 to 800 lb. per day of brown grease is sold, at a price ranging from 3 to 5 cents per pound.

Gunson (3) states the grease from sewage scum is likely to be of an inferior grade because it contains a mixture of various animal fats, cooking oils, and soaps. However, after suitable treatment it appears likely to be serviceable as a source of glycerine and fat for low-grade soaps. Apparently not all refiners are equipped to handle such scum.

Grease in Sewage Treatment. Recently Fales and Greeley (5) discussed grease in sewage treatment, covering not only its characteristics, effect on sewage treatment plants and the tests for grease but also the methods for removal and disposal. In the sewage art, some writers distinguish between "oil" (i.e., fuel and lubricating oil, gasoline, and kerosene) and "grease." Others use "fat" and "grease" as synonymous. Others assume that "ether-soluble" material is an adequate description, whereas in the laboratory various solvents (i.e., petroleum-ether, ethyl-ether, chloroform, isopropyl-ether, carbon tetrachloride, and benzine) are used, which may give very different results. (See also PUBLIC WORKS for July 1943, page 46.)

The more common solvents are chloroform, petroleum-ether, and ethyl-ether. Of these, chloroform gives the highest results and petroleum-ether the lowest. Up to 1919, Standard Methods recommended ethyl-ether, but thereafter petroleum-ether. It is unfortunate that many, in quoting the determinations of grease in sewage, have neglected to state the methods used.

Grease in Sewage. The grease content in various sewages reported in the last 25 years has varied from 25 to 100 p.p.m., with a maximum of 500 p.p.m. in a sewage containing a large proportion of tannery wastes. On a per capita basis, the range is from 0.02

(Continued on page 52)

Development of A Village Water Supply

By I. RUSSELL RIKER

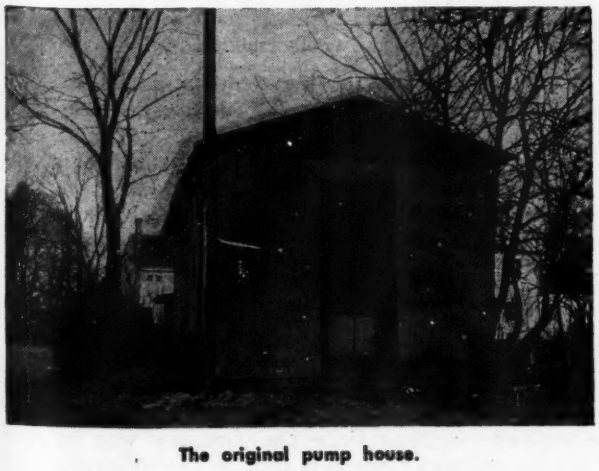
Nobody wanted to own the system, but citizens organized a Water Company as a civic duty—and it has been paying them 6 percent interest for twenty years.

THE village of Lawrenceville, Mercer County, New Jersey is a very old community, famous as the home of the Lawrenceville School for Boys, which occupies the land on one side of Main St. while the village is on the other side.

In the 1880's the school installed water and sewerage systems, the former including a standpipe 10 ft. by 85 ft. high, which is still in service after nearly 60 years. A few of the village residences also were served by this water system, but most of them had individual wells.

About 1910 the owner of one of these wells developed his supply to serve a few neighbors and ultimately served practically the entire village. This supply had no storage except a pressure tank, but in 1914 the owner purchased a 20 ft. x 60 ft. tank which, elevated on a tower, had served the Princeton Water Co. for 31 years, and placed this on the ground at a high elevation, where it continued in use for 29 years more.

Most of the pipe in this private system was 1", and the largest was 2", so it furnished no fire protection. The citizens, however, became anxious for such protection; the owner of the village system could not furnish it and the School could not do so legally without complying with the requirements of a public utility; so a public meeting was called to discusss the matter. This meeting decided to ask the local governing board to purchase the existing supply (the only parts of which that could be used being the standpipe and a few hundred feet of 2" pipe), organizing as a water district in the Township. This the board declined to do, but agreed to pay $25 a fire hydrant to a water company, should one be formed. The result was that

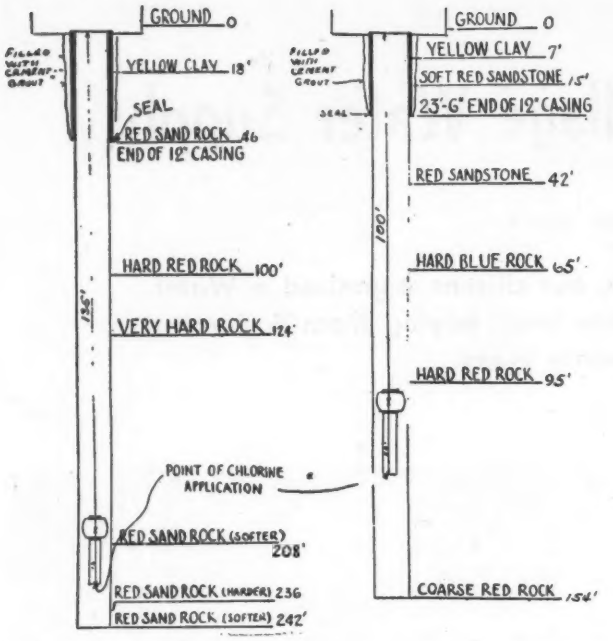


The original pump house.

No. 1, No. 2 and No. 3 new pumping stations.

a mutual company was incorporated called the Lawrenceville Water Co. with a capital stock of $50,000 (of which only one hundred $100 shares were sold at that time). No person was permitted to buy over 10 shares. Purchase of them was considered to be a public service and many did not expect ever to receive any interest; but 6% interest has been paid every year until 1942, when it was reduced to 5%.

To obtain the supply, a well was driven 230 ft. deep; 6" mains were laid with leadite joints (there are now 14,218 ft. of 6" pipe and 24 hydrants); another private suppy was purchased in 1930, and at present the company supplies 240 families estimated to total 975 persons.



Logs of wells and casings.

The well gave only 30 gpm in dry weather, although the wells for the school, less than half a mile away, furnished an abundant supply; so in 1933 a second well was driven, about a half-mile from the first, to a depth of 110 ft., where an apparently good vein of water was struck, giving 60 gpm, which could be removed by a suction pump at a cost of less than a dollar a day—little more than half the cost of lifting with a deep-well pump. This water contained 20 ppm of CO_2, which was removed by lime treatment.

But this well also gave out during a dry spell, and neither blasting nor blowing it was successful in making it flow, and a third well was driven, about 500 ft. from it, 154 ft. deep, which tested 100 gpm and has not fallen below 65 during dry summers, and no lime treatment was needed. In this well a Worthington turbine pump was installed 100 ft. below the surface and has given good results. In 1942 another well was driven a few feet from this and to a depth of 252 ft., and when both are being pumped they do not seem to affect each other. Either of these two 12" wells, which were driven according to the standard specifications of the American Water Works Association, is capable of supplying the demand, which averages 42,000 gal. a day with a maximum of 100,000.

The logs and construction of these two wells are shown in the accompanying sketch. A 12" wrought iron casing extends from above the pump floor down 10 ft. into solid rock. The bore hole to this depth is 16" in diameter and the annular space outside the casing was filled with cement mortar. The pumps, located at depths of 100 ft. and 135 ft. respectively, have 4" suction and discharge, and a capacity of 100 gpm each. Power is furnished by a 10 hp. motor, the base of which fits tightly over the well casing and rises 1½" above floor level and was grouted. The motor shaft, a chlorine line and the discharge pipe pass through this plate.

In spite of the sealing of the tops of the wells, the water sometimes contains B. Coli, and it is chlorinated by means of a Wallace & Tiernan hypochlorinator, through the pipe shown on the sketch. Each well is housed in a neat stucco building heated by a small oil heater.

Some years ago a cross-connection was made between the school and village supplies for mutual assistance in case of fire or failure of either. Later, when the law prohibited cross-connections between a public supply and a private or unapproved one, the school wells obtained approval as a public supply by the State Department of Health.

No meters were ever installed, the water rates being based on the number and kinds of fixtures. The rates, which are the same as those established by the private owner 25 or 30 years ago, are:

One hydrant (domestic use)	$10.00 per year
Each additional hydrant	3.50 per year
Bath tub	5.00 per year
Wash bowl	2.00 per year
Toilet	5.00 per year
Hose spigot	6.00 per year

The company had to install curb stops for each family, for it has become necessary in some cases to threaten to shut off the supply if bills were not paid and in many instances several houses were connected house to house through the rear yard. New mains were laid in the public street where possible, and where not, rights of way were secured. Where a new extension was desired and the returns would not warrant a company investment, the applicants paid for it themselves, getting back over a 5-year period water rent received from customers on the line. At the end of the 5 years the line became the property of the company.

There is a part-time operator, who visits the wells three or more times a day, and a secretary who keeps the books and makes out the bills.

Daily tests are made of the water for residual chlorine. Tests for B. Coli are made four times a year by the State. Reports are sent monthly to the State Department of Health on daily operations. Frequent reports are also sent to the State Water Policy Commission and the Utility Commission which controls the water rates.

The gross annual income now consists of $6,479 from water rates and $600 from the village for hydrants. The expenses are as follows: General expenses—administrative, legal, salaries and directors' fees ($3 a meeting), $993. Power $1,050. Station operator, $480. Materials and labor on collection and distribution system $889. Purification $65. Taxes $367. The total, $3,844, leaves a net income of $3,235 with no allowance for depreciation, interest and dividends. The interest takes $40; $1,931 was paid as dividends and $1,100 was put in the replacement fund.

The fixed capital of the company totals $61,600, including land, $1,600; wells, $2,862; chemical purification apparatus, $1,394; structures, $2,599; electrical power equipment, $4,888; pumps, $568; standpipes, $9,528; distribution mains $32,273; services $4,400; fire hydrants, $1,334; general equipment, $195. The actual liabilities are only $40,750 of which $39,950 is outstanding stock and $800 is notes.

The directors feel that, after twenty years of operation of a utility that nobody wanted to own, the record is not so bad; and the problems, while creating headaches at times, are not too severe for small communities. The directors, aside from the writer (who has been engineer since the company was incorporated), are small business men in the community.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 54-57*

Laying a test section sand-asphalt-filled steel grating at Darien.

Steel Grating Used for Road Surfacing

By WALTER A. BATES
Superintendent of Highways and Bridges, Darien, Conn.

A test section of road using steel subway grating filled with sand and asphalt, similar to that used by our army for airport landing mats, is being tried out at Darien, Conn.

THE Town of Darien, Connecticut, is trying out a new type of road pavement, using steel subway grating similar to that used for airport landing mats by our army abroad. The test strip is about 50 feet long and 22 feet wide, laid on a section of secondary road that has a very poor subdrainage and is adversely affected by frost action. It was thought that this was a good condition under which to make the test. Careful observation will be made, particularly next spring when the frost is leaving the road, to note what effect the grating has had in comparison to the road surface at either end.

The grating was delivered on the job by motor truck in sections approximately 2 feet wide and 12 feet long, each of which weighed about 130 pounds and was easily handled by two men, and joined together very quickly by a special type of clip developed by the Irving Subway Grating Co., which furnished the grating.

The sections were laid directly on the surface of the existing highway, which was a natural earth and gravel surface that had been treated for two or three years previous with applications of MC-2 asphalt at the rate of ½ gallon per square yard and then covered with a good grade of coarse sand with pebbles not exceeding ½ inch in diameter.

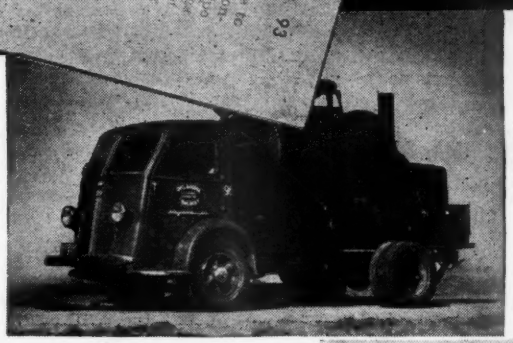
After the 44 sections had been joined together, about ¼ gallon per square yard of MC-2 asphalt was sprinkled on the grating. This was done primarily to coat the grating with asphalt and to help to prevent rusting and deterioration. A good grade of coarse sand was then used to cover the oil and was applied in a quantity sufficient to fill the open mesh to the top of the grating. Then a second application of about ½ gallon per square yard of MC-2 asphalt was made and this in turn was covered with sand. The surface was broomed and traffic allowed to compact the sand and asphalt. Enough sand was applied so that, when compacted, the sand and asphalt mixture was even with the top of the grating.

Care was necessary to use a correct amount of asphalt, so that the mixture would not be too dry and thus tend to ravel, or on the other hand contain too much asphalt and thus be too wet.

There are many sections of road in Connecticut that have to be sub-drained in order to maintain a stable sub-base and it may very well be that under these conditions a grating can be developed that would make it economical to install, rather than using other methods of stabilizing the sub-base.

Postwar Road Jobs

American Road Builders' Association has published a 64-page pamphlet entitled "A Sound Plan for Postwar Roads and Jobs," which plan "provides for full employment, better transportation and active markets." So widespread has been the interest in this plan, first published in February, that three additional printings have been necessary. This fourth printing contains considerable new material. Copies can be obtained from the Association's office, International Building, Washington 4, D. C.



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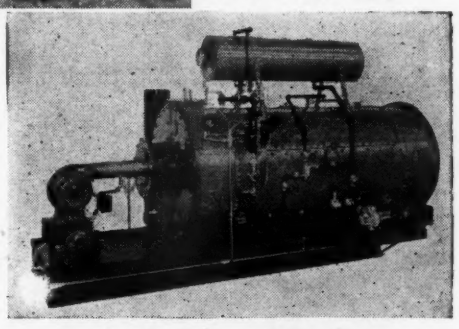

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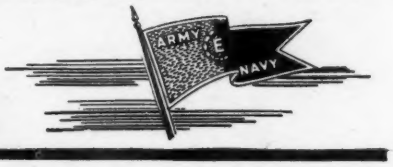

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Wartime Sewer Construction By Special Assessment

By E. N. FLETCHER
City Engineer, Des Plaines, Ill.

Unsanitary conditions made sewer extensions necessary. The sewer rental plan was opposed by home owners. So four miles of sewer were built by paying contractors with special assessment bonds.

IT wasn't a big job—less than four miles of small pipe sewer—and the construction was not especially difficult. Fifteen years ago it would have been just another special assessment job; but it was the first special assessment job in this city in over eleven years and one of the very few in the State of Illinois; for some years contractors have not been interested in special assessment bonds. So the why and the how of special assessments was the interesting feature of this job. Perhaps with the disappearance of Federal financial backing for public works, other cities may wish to learn how we put through the plan.

In 1938 a subdivision of some 80 acres was laid out in a section somewhat removed from the main part of the city; 354 lots were sold quickly, and within two years 139 homes and a grocery store were completed and occupied. Most of them were built with F.H.A loans; but that agency was then young and had not formulated its present high standards, and the subdivision, although provided with water mains, had no sewers but relied upon septic tanks.

Most of the lots are only 55 x 150 feet and the soil is a tight clay—conditions poorly adapted to septic tank and tile field sewage disposal. This was the city's first experience with septic tanks on small subdivisions, and several builders were able to get by with inadequate tank and tile field construction. The average daily water consumption was 60 gallons per capita. The result was that the tanks and tile fields were overloaded, water seeped into the fills around basements and in a number of lots bubbled up to the surface.

By 1941 conditions were serious. The FHA refused more loans until a sanitary sewer had been constructed. The local civic organization, after almost a year of investigating every conceivable method of overcoming the difficulties, decided that construction of a sanitary sewer throughout the subdivision was the most sanitary and economical solution. Financing it was the next problem. Having the sewer built by private capital which would reimburse itself, with a reasonable profit, by charging a connection fee was considered but seemed to be impracticable.

Finally the RFC granted a loan on bonds based on an annual income from sewer rental. The question was raised whether a sewer rental plan that covered only a part of the city would be legal, but it was decided it would be, because the section's sewer system would be complete in itself with no connection to any other sewers in the city. Sewage from all the rest of the city discharges into an interceptor of the Chicago Sanitary District; but this subdivision lies 1½ miles from the interceptor and it was calculated to be cheaper to treat the sewage in a small individual plant.

But under this sewer rental plan the vacant lots would pay little or nothing, which was seriously objected to by the home owners; and the only solution left appeared to be straight special assessment against all lots. As already stated, contractors are not interested in special assessment bonds unless informed where they can be sold. But a few years before, a neighboring city had financed a lighting system by special assessment, using a new plan set up by a Chicago bond attorney, whom we employed to set up our sewer bonds in the same way. Under this arrangement the bonds are issued serially and can be called at any time, whenever the money becomes available to pay for them. By this method a considerable saving in interest can be made, permitting an attractive rate. We were able to tell contractors where the bonds could be sold, and obtained a bid for the work well within the engineer's estimate, although this had been made almost a year previous when prices were lower.

The system consists of 19,000 ft. of 8″ to 12″ vitrified clay pipe. There were no special construction features except that 3,000 ft. of 12″ pipe was laid in cuts 12 to 17 ft. deep. No priorities were granted, but this affected the job only by making it necessary to use vitrified pipe encased in concrete in lieu of cast iron for crossings under the creek and railroad. The contractor, however, was severely handicapped by lack of priorities for lumber and equipment repairs. During the winter breakdowns of equipment were frequent. Some parts could not be replaced from stock and had to be made by the contractor in his own shop. Among other things, he designed and built a complete bucket for one of the back-hoes and made many repair parts from scrap steel on hand.

The equipment used on the project comprised two ¾ yard back-hoes made by the General Excavator Co., an Austin trencher and an Austin backfiller.

The sewer was designed and constructed under the supervision of the author, under Mayor Charles H. Garland. Charles F. W. Forberg was the inspector for the city. Frank M. Opeka, attorney for the city, handled the legal proceedings.

Water Supplies for Canadian Aerodromes

CANADA is operating more than thirty aeronautical training schools, the populations of which average about 1400 and in most of them have doubled in the two or three years since they were built. For several of the stations, water was obtained from municipal supplies, but the majority are supplied from wells especially for this purpose. The water from many of them is quite hard and a softening plant has been installed at one plant and probably will be at others.

The majority of the wells are 50 ft. deep or less,

(Continued on page 42)

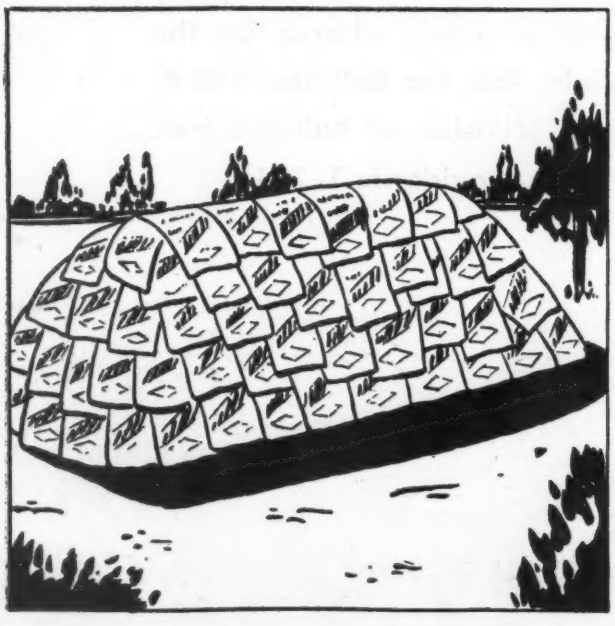
Skidproofing Icy Surfaces with Abrasives

Instructions for using cinders or other abrasives, mixed with calcium chloride. Stocking in piles or hoppers. Treating airport runways. Mechanical spreaders.

ICE on highways and airports presents a major winter hazard, that of skidding. The method commonly employed for preventing skidding is to spread a thin film of abrasives over the surface. The abrasives used should be of a hard, durable fraction of sandstone, limestone or cinders having a gradation from ¼" down to 100 mesh size for highway treatment, and ⅛" to 100 mesh for airport treatment. Oversize material on airport runways, when not properly anchored, may be a serious hazard in the propeller wash. Cinders are considered to be most effective for skidproofing. However, cinders are not always easily available in some localities, and in these sand and crushed stone are commonly used. Most fine sands of 100 mesh and finer will not function effectively as an ice abrasive material, as the fineness causes rolling up or bulking when saturated with moisture.

The abrasives should be obtained and stored at strategic points in the fall before freezing weather. They will probably be wanted in a hurry and during stormy weather, when the roads over which they must be hauled are difficult for traffic, so they should be stocked within the minimum practicable distances of all points where need for them is anticipated. To facilitate loading the trucks, many highway departments store them in elevated hoppers from which the trucks can be loaded by gravity.

If rain or melting snow enters a pile of abrasives they may freeze solid for a considerable depth unless completely enclosed in a rainproof shelter, or unless they be treated with some material that will prevent freezing. Even when so treated, rain or snow may freeze on the surface of the stock pile, and some shelter is desirable, if only covering them with waterproof paper, canvas, or mats sprayed with asphalt or tar. It is claimed that calcium chloride, if properly applied, will prevent freezing at temperatures down to —59°F. It can be applied in dry flake form, or as a solution.



Stockpile of abrasives covered temporarily with Dowflake bags.

In addition to preventing the freezing of the abrasives, calcium chloride causes them to embed themselves in icy surfaces, preventing them from being blown or washed away or thrown to the sides of the road by passing traffic.

In general practice for highway use, flake calcium chloride in quantities of 50 to 100 pounds per cubic yard of abrasive is thoroughly incorporated and uniformly mixed. The initial moisture in the abrasive causes the flake calcium chloride to dissolve very readily and to thoroughly coat each particle of abrasive.

In treating abrasives in freezing weather or treating dry abrasives, it is desirable to use a solution prepared by dissolving 4 to 5 pounds of flake calcium chloride per gallon of water and thoroughly mixing the solution with the dry abrasive at the rate of 12 to 16 gallons per cubic yard.

For Airport Runways

In treating abrasives for icy runways, special precautions and modifications of highway practices are advisable. First, it is very necessary that abrasives be prepared and stored, because it is desirable for the alkalinity of the treated abrasive to be kept near the neutral zone. Freshly prepared abrasives possess a pH of 8.5 to 9, but, on exposure to air, the pH quickly approaches the neutral point of 7 and remains near this point. Sands and cinders moistened with water retain a higher alkalinity than those treated with calcium chloride solution.

Second, airport runways are readily accessible from one central stock point, eliminating the necessity of maintaining stocks of material at different points as practiced in highway ice control procedure.

The simplest method involves the use of liquid calcium chloride with abrasives. Calcium chloride flake is dissolved in water at the rate of 4 pounds per gallon for temperatures down to —22° F. For lower temperatures additional quantities are required. The eutectic point of a calcium chloride solution may be reached at —59° F. with 5 pounds of calcium chloride per gallon of water.

The general procedure for preparing the anti-skid abrasives is to mix thoroughly the calcium chloride solution with the dry abrasives at the rate of 5 to 12 gallons of the solution per cubic yard of abrasive. Thoroughly mixing is achieved in a mixing machine of the pug-mill or concrete mixer type.

Application

The best application may be accomplished by using mechanical spreaders with modern controls, such as the revolving disc type. The quantity of treated abrasives for a given area will vary from .5 pound per

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 54-57*

square yard to 1.5 pounds per square yard, depending on the conditions at the time of application.

Ice Removal

Ice removal has become a general practice with many maintenance engineers. The operation can be accomplished readily by making a light application of calcium chloride flake on the icy surface. On coming in contact with the ice, each tiny flake will proceed along a zig-zag path, penetrating the depth of the ice. On reaching the base of the ice, the particle disperses itself in all directions, freeing the ice from its bond so that it can be bladed off easily. It is important that the loosened ice or resultant slush be removed as promptly as possible by blading. Loose ice or slush is a menace to traffic. There is always the danger that the temperature may suddenly drop and refreeze the ice into a rough surface texture. Hard-packed snow may be removed in the same way.

Lewiston's Parking Lot

Lewiston, Idaho, with a population of 10,543 by the 1940 census, now has a municipal parking lot in the business center in which as many as 139 cars have been parked at a time. To construct this lot required placing 4200 cu. yd. of material to bring it to grade and building a storm sewer to drain it. This grading, removing buildings and constructing a retaining wall cost $1,783. The area was rolled and surfaced with sand and gravel, four concrete driveways were laid and bumpers were set at a cost of $329. A group of business men appointed by the Chamber of Commerce purchased the property and deeded it to the city. Parking meter funds were used for developing the site. These meters have been in service since April, 1940, and during the first two years of service the 170 meters netted the city $27,154 in revenue.

Operating Results of the Minneapolis-St. Paul Sewage Treatment Plant

(Continued from page 15)

Shutdowns.—This plant shut down for about a week twice during the year. This permitted inspection of plant equipment and the making of necessary repairs. Shut downs are scheduled for periods of high water in the river when nuisance will not be caused by discharge of the raw sewage.

Miscellaneous.—All employees were reinoculated against typhoid and paratyphoid at plant expense.

The cost of operation and maintenance of the plant amounted to $279,497. The cost per million gallons for 1942 was $6.95, compared to $7.80 in 1941 and $8.05 in 1940. The cost per ton of dry solids removed was $6.15.

Personnel.—The Board of Trustees of the Minneapolis-St. Paul Sanitary District include A. G. Bastis, chairman; R. A. Olson; Milton Rosen; J. S. Findlan; M. L. Kline; A. R. Gisslen; and Lawrence Rylander. George J. Schroepfer is chief engineer and superintendent. Kerwin L. Mick, who was chief chemist, is now an officer in the Sanitary Corps of the U. S. Army.

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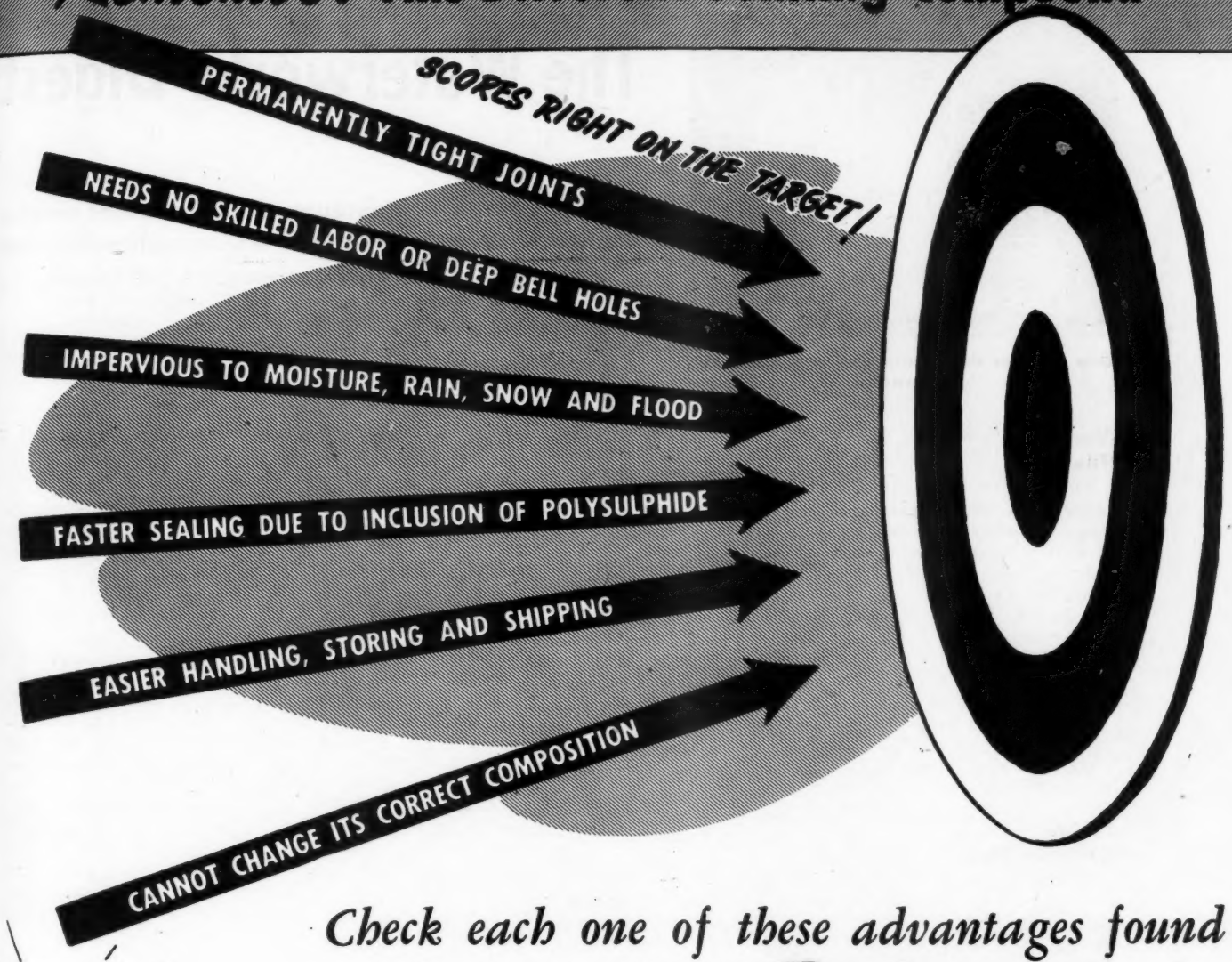

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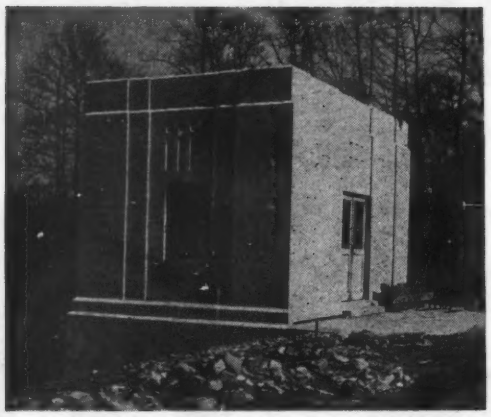


Gate house at sedimetation tank of Ashland, Ky., waterworks.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

Water for The Army

Throughout the Sicilian campaign the 45th Division used about 50,000 gal. of water a day, or 2 gal. per man. An army can exist and fight on one gal. per day. Engineer officers scout the country right behind the retiring enemy looking for water. At least three water points are set up for each division and usually five. This is filtered, chlorinated and pumped into a 3,000 gal. canvas bag, from which it is drawn off into cans or tanks and carried to the front. For miles around signs saying "Water Point," with arrows pointing to it, are staked along the roads.

In Sicily the sources were mainly wells, springs, little streams, shell craters and irrigation ditches. Some dry river beds were found to have flow a few feet below the surface.[A117]

Laying Concrete Pipe

Concrete pipe for water has as advantages: Williams-Hazen coefficient of 140-150, which is maintained unimpaired; failure, if any, by stretch rather than rupture; saving in critical materials. Leakage per inch-mile is frequently as low as 25 gpd. In most situations it is competitive in price with other materials for sizes from 30" up. Leaks after construction, which may develop if it is not well designed and well laid, are difficult to repair. It is very heavy and must be handled carefully to avoid damage, especially by chipping of collars or bells.

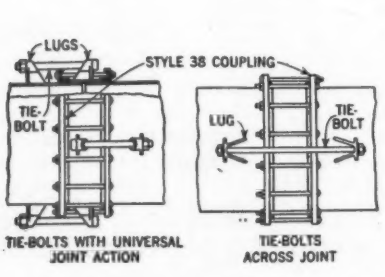
It is of primary importance that the manufacturer have had successful experience with the type of pipe furnished; if possible, a single contract should be made for both manufacturing and laying the complete job; if laying is contracted for separately, the manufacturer should furnish an experienced superintendent to oversee it. In handling the pipe, it should never be dropped. It should be supported on the ground on skids, especially in winter weather when it might freeze to the ground.

For excavating, a back hoe is generally preferable to a ladder type, for it can be used for lowering the pipe into the trench, and the latter digs the trench much more rapidly than the pipe can be laid. The bottom of the trench is not rounded to fit the pipe, but backfilling well rammed in 6" layers up to the ¾ point is necessary. In soft ground, a foot or more of the bottom should be replaced with gravel or broken stone, or piles and timber cradles used. If calked mortar joints are used, the mortar should be either neat cement, or 1½ cement to 1 plaster, as dry as possible, calked in 1½" layers. Poured joints should be of 1 cement to 1½ sand of the consistency of thick cream, using a rope runner held in place by the backfill and left permanently. In 36" pipe or larger, the joints are usually pointed up on the inside after backfilling. Rubber gaskets are not now permitted to contain more than about 1/3 rubber, but this appears to be satisfactory. Manholes should be provided at intervals of 1,000 to 1,200 ft. Bends, angles, tees and plugs should be backed with concrete buttresses.[A118]

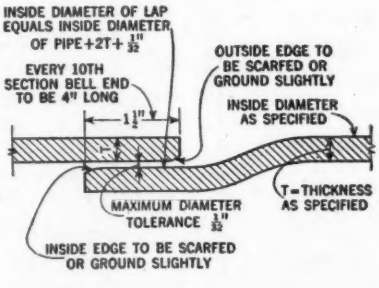
In handling 36" pipe in Chicago (see Digest G 39), rope or band slings were required, never wire cable. Each pipe was set on double blocking, 3 ft. ahead of the last bell and 2 ft. back of the forward bell, and lifted into exact grade by driving two wedges between blocking and pipe at each end. Each joint was sealed, after two pipes ahead had been set, by pouring hot roofing asphalt back of an asbestos roll. Backfilling below the center of the pipe was sand flushed with water.[A119]

Laying Steel Water Pipelines

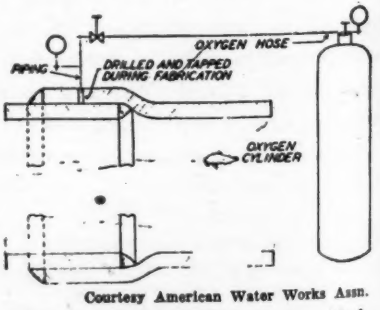
The chief items considered in this paper were preservation of the coating and jointing. In handling coated steel pipe, only slings should be used made of fabric belting whose width is at least 2" plus 1" for each 1,000 lb. weight. While traveling in trucks, the pipe should rest on bolsters curved to fit the pipe and heavily padded, and pads be used under the tie chains. It should never be rolled on the ground; and should be swung, not dragged, to position in the trench. Workmen should not walk on the pipe unless wearing shoes with rubber or composition soles and heels, and tar paper should be laid in the bottom inside until there is to be no further walking through it. If the bottom of the trench is rock or covered



Mechanical joint harness to take longitudinal pull.



Type of slip joint for field welding, required for welded steel water pipe.



Courtesy American Water Works Assn.

Method of testing tightness of welded bell and spigot joint.

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 54-57*

with solid, hard objects, it should be covered with at least 3″ of sand or screened earth. A bell hole should be dug where the sling will come when the pipe is in place, so that the sling can be removed without damaging the coating.

Field welding of joints is practicable only for pipe 27″ in diameter or larger. Welding gives a rigid line that is advantageous for spans supported above ground but distinctly not so in filled or unstable ground. A few welded joints each side of a gate valve or angle aid in resisting the thrust. After the pipe is backfilled and in use they give no trouble from expansion and contraction, but may do so during construction; to prevent this, leave joints unwelded at 500 ft. intervals, and weld them later in the cool of the morning. When exposed above ground, use of an occasional mechanical joint will allow for temperature changes. If such couplings are used throughout, undue movement at any one joint can be prevented by bolts connecting clips welded to the pipe each side of the joint. Bell and spigot calked joints can be used with heavy-gauge pipe; no heat being used, the lining does not need to be patched afterward, as must be done when joints are welded.

When pipes are larger than 12″, valves smaller than the pipe are generally used, with long reducers. Cone valves give less loss of head than gate valves. A lead or mechanical joint should be used on one side of each valve. To lessen the difficulty of operating large valves it is desirable to have fully machined gears in grease-retaining cases. Automatic air-release valves should be provided at all pronounced summits.[A120]

Field Welding Of Steel Pipe

Pipe 8″ and less in diameter can be welded satisfactorily and economically by the oxyacetylene or the electric metallic arc process. Some gas welding equipment manufacturers claim that both processes can be used for pipe up to 16″. Selection of the proper filler metal is important. Several types are satisfactory for roll welding, but for welding stationary pipe an all-position rod should be used; A.W.S.-A.S.T.M. E-6010 rod is believed best. The best type of welding equipment is the D.C. generator type. Under certain conditions the transformer type may be satisfactory.

The joints welded can be slip joints, single or double welded; butt joints; or butt strap joints. Slip joints are seldom used where the pipe shell exceeds ½ in. They have the advantage over butt joints that the ends are easier to tack together, they permit slight angles in the pipe line, and if the pipe is 27″ or larger the joint can be tested by oxygen or air pressure as soon as completed.

In butt welding the ends should be beveled if more than 3/16 in. thick; double beveled if large enough to be welded on the inside.[A121]

Control Of Chlorination

A committee of the A.W.W.A. presented methods "designed to measure the amount of chlorine, to indicate whether the chlorine is free or combind with ammonia, and to provide means for determining the desired treatment"; to be used on "(a) polluted water, (b) water in process of purification, (c) at the end of the purification process, (d) incidental to the distribution of water prepared for human consumption, (e) on swimming pool water, (f) on condenser water and (g) on industrial process water."

The methods presented are the orthotolidine, the iodometric, the chlorine and chloramine differentiation, the chlorine demand, and the drop dilution and chlorine demand methods for field use. The iodometric determination of residual chlorine can be made more precise than the orthotolidine; acid titration is preferred when interfering substances are known to be absent, but hydrochloric acid should not be used—acetic acid is best.

"The only means now known for determining accurately the amount of free chlorine and the free chlorine combined

with nitrogen compounds, in a mixture, is by the use of the amperometric method."

The drop dilution method is designed for rapid field measurements of residual chlorine where concentrations exceed 10 ppm, as in sterilizing mains. The field method for chlorine demand gives only approximate results, obtained by the use of "zonite."[AI24]

Microfilming Waterworks Records

Loss by fire, war destruction or otherwise of records of a water works or other utility would be a serious matter. To replace them would be costly and difficult if not impossible. Microfilming them gives precise, exact facsimiles that can be stored in very small space in one or more other cities. From these, prints can be made, enlarged to the original size. Maps 28" x 37" can be reproduced, giving 1,000 sq. in. on 1½ sq. in. of negative. The imperishable safety film used is said by the National Bureau of Standards to have as long a life as good all-rag paper—probably 500 yrs. The Internal Revenue Dept. has ruled that microfilming of business records is an ordinary and necessary expense of business, deductible in computing earnings for income tax purposes.[V3]

Available Materials Used for Water Plant

A pumping and purification plant built to supply 1.5 mgd of river water to an eastern ordnance works was built of materials quickly obtainable, so that it went into service four months after the engineers were notified to prepare plans. It consisted of a low-lift pumping station, a mixing and sedimentation basin, 3 rapid-sand filters, a filtered-water storage basin, high-lift pumps, 3 steel pneumatic storage tanks riding on the distribution system, and an elevated washwater tank. Alum, soda ash, sodium hypochlorite and sodium hexametaphosphate are used.

A 10 x 10 ft. sump 23 ft. deep was built by driving second-hand steel sheetpiling, with a concrete bottom and a concrete collar at the top which served as foundation for the pump house, which houses two electrically-driven 1,000 gpm deep-well pumps, which were available. Chemical feeders are housed in an insulated frame structure 2.5 x 6 ft., heated by two batteries of six 100-watt light bulbs. The mixing chamber, built of concrete with wooden over-and-under baffles at intervals of 19¼" to 22", gives a 15-min. displacement period. The sedimentation tank, giving a 2.2 hr. displacement period, has a longitudinal timber around-the-end baffle and wooden stilling baffles. The three filters are 13 ft. square, each with two washwater troughs of wood construction. Reconditioned second-hand rate controllers were used. All filter valves are manually operated. The 3 high-lift pumps are 500 gpm deep-well turbines, selected because readily obtainable. Of the 3 pressure tanks, one was a 3,000 gal. second-hand and two were 5,000 gal. A 25,000 gal. wood-stave tank on a 12-column timber tower 30 ft. high supplies wash water.[E10]

Meter Maintenance Increases Income

Cincinnati, Ohio, is 100% metered, with 112,000 meters in service, but up to two years ago the meters had not been kept in accurately registering condition. On one test block containing 40 meters, 34 failed to register at all at ¼ gpm. None were removed for test and repairs until they failed to register at all; and were tested only on flows of 20 gpm and 3.5 gpm. Many meters were too large, and in nearly every case where replaced with a smaller one the revenue from the service increased; in one case a 3" compound meter on an apartment house was changed to a 2" disc and the revenue increased $7 a month.

A meter maintenance program is now operating that calls for bringing every small meter to the shop to be tested every 10 years. Three 8-meter test benches are in use. Meters are tested, repaired, retested, painted and returned to service. Repaired meters must record 98% to

102% on 12 gpm, and 90% or better on ¼ gpm, and start registering on ⅛ gpm; inlet pressure 80 psi. Painting helps locate a meter in a dark basement and indicates whether it has been to the shop recently. A Kardex system shows the complete history of each meter, including the person who did each repairing and testing.[F70]

Flooding Basins For Des Moines Supply

Des Moines, Iowa, obtaines its water supply through an infiltration gallery 150 to 300 ft. from Raccoon river and 6 ft. below low water level. As silt deposits on the river bed, percolation to the gallery decreases, until a flood scours off the deposit. During the past decade, more than a third of the supply has been obtained by pumping river water into basins built on the bank of the river above the gallery, from which basins it percolates into the gallery. These also clog with silt, which is cleaned off by bulldozers and added to the enclosing levees. A total of 64.5 acres is now flooded. The levees permit flooding to a depth of 3 to 4 ft. The pumps used to fill the basins have a capacity of 20 mgd. The water consumption of the city is about 18 mgd with a maximum of 25 mgd. There is little trouble from algae growth in the basins. They were rebuilt and cleaned in 1940 and 1941.[F69]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c, Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n*
October

117. Water Big Factor in Sicily. By Emil Pyle. Pp. 1255-1257.
118. *c.* Good Practice in Laying Concrete Pipe. By Louis R. Howson. Pp. 1258-1262.
119. *c.* Experience with Wire-Wound Prestressed Concrete Pressure Pipe in Chicago. By W. W. DeBerard and W. B. Weldon. Pp. 1263-1280.
120. *c.* Outline of Installation Procedures for Steel Water Pipelines. By William W. Hurlbut. Pp. 1281-1294.
121. *c.* Field Welding of Steel Water Pipe. By H. Arthur Price and G. H. Garrett. Pp. 1295-1302.
122. War Problems in Analysis and Treatment. By A. M. Buswell, R. C. Gore, H. E. Hudson, Jr., A. C. Wiese and T. E. Larson. Pp. 1303-1311.
123. Tables for the Determination of Alkaline Compounds in a Softened Water. By Douglas Feben. Pp. 1312-1314.
124. Control of Chlorination. Committee Report. Pp. 1315-1328.
125. Some Chemical Aspects of the Ammonia-Chlorine Treatment of Water. By W. Allan Moore, Stephen Megregian and C. C. Ruchhoft. Pp. 1329-1343.

D *The Surveyor*
October 29

21. *p.* The Corrosion of Mains in Clay Soils. By H. J. Bunker. Pp. 443-444.

E *Engineering News-Record*
November 18

20. Water Plant Built of Available Materials. By Harry L. Kinsel. Pp. 97-99.

F *Water Works Engineering*
November 3

69. Artificial Flooding Builds Up Ground Water Yield. By Dale F. Maffitt. Pp. 1230-1232.
November 17
70. Cincinnati Profits by Changing Meter Practices. By Clyde Bruck. Pp. 1286-1288, 1304.

J *American City*
November

21. Mahoning Valley's Water Supply. By George R. Reiss. Pp. 38-39.
22. Wartime Water Rates. Pp. 83, 85.

M *Water and Sewage*
October

21. *p.* The Demineralizing Process of Water Softening. By Samuel B. Applebaum. Pp. 13-16, 42.
22. *p.* Pumping Station Operation and Maintenance. By C. Keeping. Pp. 18-19, 50.

P *Public Works*
November

50. Constructing an Aerator of Non-Critical Materials. By T. H. Sauter. Pp. 15, 26.
51. All's Well That Ends Well. By Charles W. Hircock. Pp. 19, 24.
52. Use All the Water You Need, But Don't Waste Any. Pp. 23-24.

V *Journal, Maine Water Utilities Ass'n*
November

3. Perpetuation of Essential Records by Photographic Process. By Charles A. Jortberg, Jr. Pp. 155-163.

W *Johnson National Drillers Journal*
September-October

6. Well Troubles—Their Cause and Cure. Pp. 1-7, 14.

Sewage treatment plant at Bagley, Minnesota.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Gas Engine Service at Cedar Rapids

In 1935 Cedar Rapids, Ia., put into service a 210 hp gas engine generator set, which has been in operation 96% of the time since then producing power at a total cost of 0.3 ct. per kwh. For 12 hrs. a day the plant's electrical load holds close to 150 kw, and averages 80 kw for the other 12 hrs. The gas engine is direct connected to a 150 kw generator. The surplus night load is sold to the local utility at 0.2 ct. per kwh, or $1,113 a year. Total cost for labor and maintenance $1,191; net cost, $78 a year; or $2,075 including interest and depreciation.[H87*]

Sewage Scum Sold by New York

New York City has been selling the scum from four of its sewage treatment plants since June 1943, receiving 0.8 ct. per pound from a contractor, who receives it in cans at the plant. During June to September the average percent of fat in the scum at the four plants has varied from 68.3 to 81.6. The amount of scum sold during the four months was 352,870 pounds (actually measured by cu. ft., and a cu. ft. assumed to weigh 60 lb.). It was considered that sale on a dry-pound or total ether-extractable content basis would involve too much laboratory work. The scum is scooped from the tanks and scum manholes with wire mesh shovels and deposited in cans, all of which must be removed by the contractor in a manner approved by the City Dept. of Health.[J15]

Pretreatment of Gelatine Wastes

Lime water waste from an English gelatine factory contained 1260 ppm caustic calcium salts and 1840 carbonate, which caused deposits 3" thick on the 9" sewer that received it. The caustic lime was partly in a colloidal state due to the presence of grease and therefore difficult to remove by plain sedimentation. Laboratory experiments were made with alumino-ferric, iron-alum, ferrous sulphate, ferric chloride and sodium aluminate, and the best results obtained with alumino-ferric in doses slightly exceeding the total lime content, especially if the lime water be first mixed with 4 times as much wash water from the plant, which contained 162 ppm of bicarbonate calcium salt; this to be followed by 24 hr. sedimentation.[D25]

American Features In an English Plant

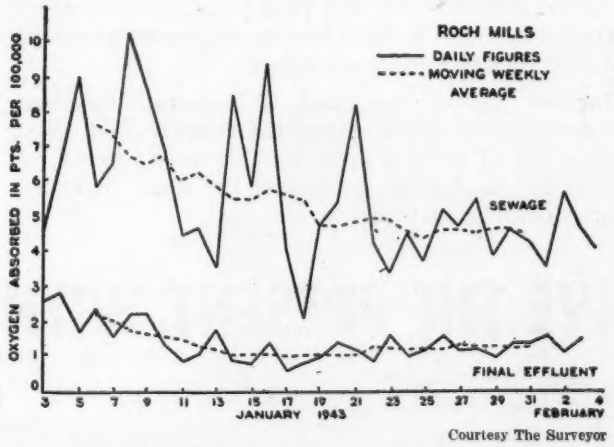
Plans for a treatment plant for 30,000 population at Salisbury, England, contain several features new to England but common in this country. One is the comminutor, of which, the author says, there are 4 in Sweden, 2 in Nice and 2 in Scotland but none in England. Another adopted idea is providing for pumping a constantly changing quantity of sewage by providing 4 constant-discharge pumps, two of 900 pgm and two of 2700 gpm, and a variable discharge pump with capacities between the limits of 100 and 1200 gpm to handle fluctuations within a 2 ft. rise and fall in the feedwell. A third novelty is the covering of sludge beds with glass, which would seem especially advantageous in a country where it rains a large part of the time.

An idea novel, we believe, to both countries is using an upward extension of the settling tanks for storing storm water. (The sewers are partly on the combined system.) The tank outlets are so arranged that when the flow exceeds normal dry-weather flow, the sewage rises in the tanks (thus increasing the rate of discharge through the outlets) until it is 4 ft. above the outlets, when it overflows through other outlets leading to the river; a device limiting the rate of effluent to the plant to 3 times the dry-weather flow.[D24]

Sampling at Sewage Works

The purpose of keeping records at sewage plants is to give proper unit control, maintain and improve efficiencies, give warning of impending trouble, provide evidence of needed maintenance or extension, and assist in determining future requirements. The records should include volumes of flow, strength of sewage, quantities of grit, of screenings and of sludge, and efficiencies of the digestion, filtration, etc. The analytical records are no more reliable than the sampling, yet this is often unsatisfactory. Considering its importance, it would be justifiable, in planning a plant, to modify channel layouts and provide mixing flumes to facilitate obtaining samples truly representative of the crude sewage, and carefully plan the location of sampling points. Allowing for large suspended solids in samples of raw sewage is especially difficult, and failure to do so may result in figures apparently showing more suspended matter removed than was contained in the raw sewage.

Twenty-four hourly samples are desirable, proportional to the flow; but the latter is of minor importance, for hourly samples taken and combined, one set in equal parts,



Courtesy The Surveyor

Comparison of daily figures with "moving averages."

*See Bibliography in October issue.

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the other proportional to flow, at two separate plants, showed differences in analyses of only 3.5% to 8%. In the case of sluge gas, it would be sufficient to make full analyses at comparatively long intervals and CO_2 analyses more frequently. Final effluents are subject to less variation than raw sewage, and less frequent samples would generally be satisfactory. In sampling sludge from sludge beds, the method suggested is to take a sample from each load removed, mix these thoroughly when the bed has been emptied, heap into a symmetrical cone, and quarter; reject two opposite quarters and mix the remaining two; and repeat this until that remaining will go into "biscuit tin."

Plots of results are very useful, but generally show peaks, valleys and plateaus that are difficult to interpret. A helpful device used in business is the "moving average"; usually the average of the twelve months ending with month in question. The periods may be monthly or weekly, but should represent a complete year or series of years. Statistical methods using the theory of least squares also may be useful.[D23]

Disposal of Garbage with Sewage

Plants for combined disposal are in operation at Lansing, Mich., and Goshen, N. Y., where the garbage is added directly to the digester, and at Findlay, O., and Marion, Ind., where it is added ahead of the plant. Complete operating results at Findlay and Marion are given and analyzed in the article. Garbage is ground and added during 15 to 30 min. periods twice a day at each plant. The author concludes that, in properly designed and intelligently operated plants, dual disposal is feasible and the most economical method of disposing of garbage. When added at the rate of one ton per million gallons of sewage, it increases the suspended solids and B.O.D. in the primary effluent less than 10%. The combined solids settle more efficiently and produce more concentrated sludge than sewage alone. The garbage does not adversely affect the oxidizing ability of activated sludge. It digests as completely as sewage but the digested sludge is of lower solids content than from sewage alone. All grit, bones, glass &c must be removed from sludge before pumping it to digesters. Two-stage digestion is necessary, with 4 cu. ft. per cap. digester capacity, and at least 7 cu. ft. if excess activated sludge is digested. The increase in cost for garbage digestion is less than 40 cts. a ton.[H43]

Sewage Disposal At Toronto, Canada

Toronto's Morley Ave. disposal works, built in 1912, consist of sedimentation tanks designed for 36 mgd, with an outfall sewer to Lake Ontario with 50 mgd capacity. The flow now averages 77 mgd and the surplus is discharged into a basin connected to the lake. Water is pumped from the lake about a mile away and discharged into this basin to dilute it at the rate of 30 mgd. The sludge in the sedimentation tanks is pumped to lagoons. Twice a year sludge in the lagoons is dredged out and pumped ¾ mile to low-lying ground. Effluent from bay to lake is highly colored, sometimes noticeable ¼ to ½ mile from shore. A new treatment plant is contemplated, but meantime some method of alleviating conditions, possibly by chlorination, is being considered.[M9]

Laundry Waste Treatment by Flotation

Where laundry wastes are large in amount in proportion to the sewage, separate treatment is desirable. This is generally effected by chemical precipitation, but under some conditions the coagulated solids float rather than settle. Instead of considering this a problem, the author suggests stimulating flotation and removing the wastes

by skimming. Experiments with vacuum flotation indicated that this caused most of the solids to float to the surface, the wastes previously having been saturated with diffused air. The most economical results were obtained with the use of ferric chloride or alum and vacuum flotation, alum being the cheaper of the two and not requiring so low a pH for high removals.[G26]

Army-City Treatment Plant

Walla Walla, Wash., built a treatment plant in 1928 of about 3 mgd capacity, but receives 3½ mgd in winter and 5 in summer. When the Army built an air base on the outskirts of the city, the Army and city agreed to bring the air base sewage through city sewers to the city plant and build there a supplementary plant, to be operated by the city and ownership of it to pass to the city in 1966 or when the army had no further use for it. As the receiving stream flows very low at times, secondary treatment and chlorination are necessary. The new plant contains a comminutor, a vacuator for removing grease, a biofiltration plant; and a 2-stage, tray-type digester. There are no sludge-drying beds as farmers and the local golf course take all the wet sludge. It was designed with a capacity of 600,000 gpd for 6,000 ultimate population at 100 gal. per cap. Later the estimate was changed to 6,680 with a flow of 70 gpcd, but the plans were not changed. The plant is operated with its own gas. The vacuator is giving excellent results, apparently removing over 90% of the settleable solids. It is set to hold a 10" vacuum.[J14]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

D — *The Surveyor*

October 1

21. *p.* Sludge Disposal at Horsham. By P. W. Browne. P. 410.

October 8

22. Worcester Sewage Works Extensions. By John B. Gibson and Percy Lamb. Pp. 411-412.

October 15

23. *p.* Some Comments on Sewage Works Records. By D. H. A. Price. Pp. 423-427.

October 22

24. *p.* Salisbury Sewage Disposal. By S. R. Little. Pp. 431-432.
25. *p.* Pretreatment of Waste Effluents. By C. B. O. Jones. Pp. 437-438.

H — *Sewage Works Engineering* — H

November

43. Dual Disposal at Two Midwestern Cities. By S. L. Tolman. Pp. 529-533.
44. Equipment Maintenance in War Time. Pp. 534-539.

J — *American City*

November

14. Air Base Sewage Treatment Plant at Walla Walla. By Emil C. Jensen. Pp. 42-43, 71.
15. How New York City Utilizes Sewage Scum. By Nathan I. Kars. Pp. 56-57.

M — *Water and Sewage*

October

9. Sewage Problems at Toronto. Pp. 17, 44.
10. *p.* Chemical Control of Sewage Treatment Plants. By Gordon C. Laidlaw. Pp. 20-21, 53.

P — *Public Works*

November

44. High Daily Rate Trickling Filter Performance. Pp. 14, 28, 34.
45. *n.* Service Charges for Use of Sewer Systems. P. 18.
46. Treatment of Cherry Waste Waters. By C. H. Young. Pp. 25-26.

Water Supplies for Canadian Aerodromes

(Continued from page 28)

although one in Saskatchewan is 300 ft. The pumps used are mostly of the vertical turbine type, electrically driven and fitted with a power take-off for use in case of power failure. They are operated by remote control from the water level in the storage tanks, by either float switch or pressure in the pipe. The pipe from pump to storage tank is generally 4" or 6" cast iron. No elevated tanks are used, but pressure in the mains is maintained by the use of pressure tanks.

Storage is provided adjacent to the pump house, at ground level; a pressure tank or tanks maintains pressure while the service pump is idle, and a fire pump boosts the pressure in case of fire. A hypochlorinator is connected to the main between the pump and the pressure tank. A typical plant is provided with two 25,000 gal. tanks of Douglas fir, wood stave, 18 ft. in diameter by 16 ft. deep, partly buried in the ground, the tops covered and insulated and the portions above ground banked on a 2:1 slope and sodded. Air Force Headquarters has decided that 200,000 gal. storage is desirable for fire protection, and unreinforced concrete saucer-shaped tanks or reservoirs with wooden roofs are being built now.

The service pumps are single-stage volute-type, double suction, capacity 130 gpm at 50 lb. pressure. The pressure control switches are generally set to cut in at 20 lb. and out at 30 lb.

The pressure tank is usually set in the upper floor of the pump house. At first one 2,000-gal. tank was used, but later installations have three 600-gal. tanks because easier to handle, cheaper and permitting better design. In operation, the service pump runs about 1 minute each 4 or 5 minutes. Air is maintained in the tank by a 2 cfm single-stage air compressor operated by a ½ hp motor. The fire pump boosts the pressure to 90 lb. as soon as a fire alarm is given. The first fire pumps were of 350-380 gpm capacity, but present practice is for 1000 gpm for main stations and 600 gpm for smaller ones.

All water passing through the service pump is chlorinated (but not that from the fire pump), hypochlorinators being used, and 0.1 to 0.2 ppm residual being obtained.

The pump house is heated by means of an electric immersion heater in a hot water radiator, or in some cases by electric strip heaters.

The above is condensed from a paper by Group-Captain A. J. Taunton, Chief Works Officer, R.C.A.F., read before the School for Water and Sewage Works Operators. For the illustrations we are indebted to "Water and Sewage" of Canada.

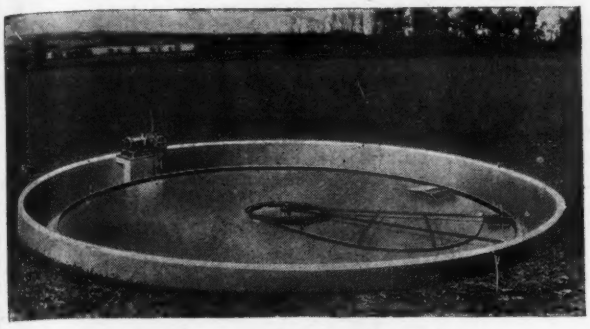
WMC's Definition of the Term "Sanitary Engineer"

FOR the purposes of clearance with the Procurement and Assignment Service of the War Manpower Commission, the professional occupational title "sanitary engineer" shall apply to a graduate of a full 4-year, or longer, course leading to a bachelor's, or higher, degree[1] at a college or university of recognized standing[2] with major study in engineering who has fitted himself by suitable specialized training, study, and experience (a) to conceive, design, direct, and manage engineering works and projects developed, as a whole, or in part, for the protection and promotion of the public health and (b) to investigate and correct engineering works and projects that are capable of injury to the public health by being or becoming faulty in conception, design, direction, or management.

Successful performance in the field of sanitary engineering requires an intimate and working knowledge of the basic physical, chemical, biological, and engineering sciences upon which the profession is based, and the ability to identify, evaluate, and explain in terms of their sanitary and public health implications those environmental factors that will promote and protect health as well as those environmental factors that are capable of injuring health.

(Continued on page 52)

Keeping Up With New Equipment



Yeomans "Rim-Drive" Clarifier Tank.

A New "Rim-Drive" Clarifier Tank

Yeomans Bros. Co.
1409 No. Dayton St., Chicago 22, Ill.

Most outstanding features are the location of the motor, the controls and all parts of power transmission on the rim of the tank.

Power applied at the rim takes full advantage of the lever arm principle. Center drive mechanisms must move loads at both ends of the scraper assembly, while the "Rim-Drive" applies power at the periphery of the scraper assembly, reducing power requirement to a minimum.

Yeomans Bros. Co. say for a 40-foot diameter primary clarifier with automatic skimmer using a center shaft, good practice would indicate a gear reducer of 30,000 inch-pounds torque capacity including allowance for safety factor. The Yeomans "Rim-Drive" design would require only 125 inch-pounds, a torque saving of over 95 per cent. The economy is accomplished by eliminating all elements of the drive from the center of the tank.

In addition to reduced torque demand the "Rim-Drive" has other cost-cutting features. Bridges and walkways are unnecessary and are eliminated. Costly reduction-gear assemblies are replaced with a simple inexpensive worm-gear assembly at the rim of the tank. Many other miscellaneous parts are eliminated because of the extreme simplicity of the "Rim-Drive" design.

Another new Yeomans product is the "Auto-Skimmer" and "Auto-Flusher" for primary clarifier tanks, designed for maximum efficiency with few parts.

The "Auto-Skimmer" is equipped with a curved skimmer blade which concentrates the scum into a very restricted area near the periphery. A spring loaded, steel, knife edge, hinged scraper blade wipes the scum over a steel scum apron into a scum trough. No scum trough valve is needed as the "Auto-Flusher" opens automatically before the scum is deposited in the scum trough and continues to flow until the scraper blade has left the trough.

Bulletin 6710 describes the "Rim-Drive" in greater detail and will be sent on request.

New Road Dummy Strip Made of Mastic Board

Keystone Asphalt Products Co.
43 East Ohio St., Chicago 11, Ill.

This dummy strip, which is ⅛ inch thick, has a high degree of rigidity and meets all Federal and State specifications. The strip is furnished in full-size sheets, 36 inches wide and up to 10 feet long, scored to the required widths,

which are generally 2, 2¼ or 2½ inches. The sheets are easily taken to the job, and the strips break off in the same manner as you break off a square of chocolate from a candy bar. This dummy strip is a homogeneous product and is completely waterproof.

The manufacturer says more than 1,000,000 feet of the new Keystone mastic board dummy strip has just been used by a contractor on two airport projects. Further information on this new product may be obtained from the manufacturer.

Mango Wedge Points for Sharpening Digger Teeth

Allied Steel Products, Inc.
N.B.C. Building, Cleveland 14, Ohio

By welding the Wedge Points, made of Manganese cast steel to worn teeth on excavating buckets, ditching machines, scarifiers, draglines and dipper buckets, they are restored to original sharpness and efficiency.

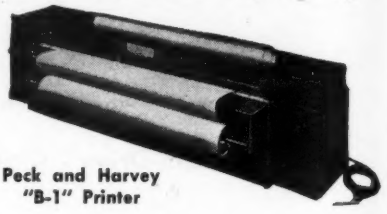
For full information on how to quickly and economically make the teeth of the equipment mentioned above practically as good as new, write the company for a copy of the descriptive circular.

Table-Type Continuous Printers for Blue Prints and Black and White Prints

Peck and Harvey
4327 Addison St., Chicago, Ill.

The "B-1" and "B-2" models produce clear, are compact, easily portable—can be placed on any convenient table or bench—are simple and easy to operate and maintain. No special wiring required—simply plug into any standard electric outlet.

They take cut sheets or continuous rolls. Any drawing



Peck and Harvey "B-1" Printer

or tracing, or printed matter up to 44" wide, or any combination (as many as five 8½" x 11" sheets) may be fed into the machine at one time. Prints any length continuously, without side travel, blurring, or wrinkling.

Use of Cooper-Hewitt mercury vapor tube lamps mounted horizontally gives absolute uniform light intensity overall. Super-Clear, hand polished contact glass and sliding contact insure clear, clean overall exposure. Ball-bearing equipped variable speed drive provides wide range of speeds. No lubrication required.

For complete details, write for new "B-1" and "B-2" Bulletin.

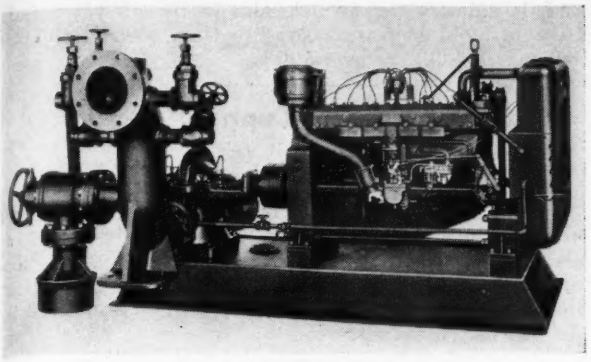
Ten Companies Join Asphalt Institute

Ten additional Asphalt producing companies have been elected by the Board of Directors of The Asphalt Institute, bringing the total number of companies constituting its membership to thirty-seven. The new members are:

Bell Oil & Refining Co., O. C. Field Gasoline Corp., Five C. Refining Co., Gilmore Oil Co., Golden Bear Oil Co., The Petrol Corp., all located in Los Angeles, Calif.; Exeter Refining Co., Long Beach, Calif.; Inland Empire Refineries, Inc., Spokane, Wash.; Kanotex Refining Co., Arkansas City, Kans.; Wasatch Oil Refining Co., Salt Lake City, Utah.

This increase in membership is significant, pointing as it does to the important part the Institute must play in post-war developments—both in its engineering and research fields.

To cover the southern California territory adequately, the Institute has established an office in the Pacific Mutual Building, 523 West Sixth Street, Los Angeles 14, Calif., and Arthur H. Benedict has been appointed Engineer-in-charge.



Fairbanks Morse Engine Driven Fire Pump.

New Engine-Driven Fire Pumps

Fairbanks, Morse & Co.
600 S. Michigan Ave., Chicago 5, Ill.

With the national fire loss for 1942 amounting to nearly a third of a billion dollars in mind, Fairbanks, Morse & Co. announces a new line of gasoline engine-driven fire pump units in capacities of 500, 750 and 1000 gallons per minute.

The purpose of these pumps is to provide emergency standby fire protection if electric power or steam pressure becomes unavoidable, and to supplement electric motor driven or steam turbine driven fire pump units.

The company says this new line of engine-driven fire pumps fully conforms to the specifications of the National Board of Fire Underwriters and the National Fire Protection Association and carries the approval of the Underwriters laboratories. Bulletin No. 5813-FS fully describing this new line of fire pumps may be had upon request to the manufacturers.

WPB Publishes "Salvage Manual for Industry"

The first comprehensive practical manual on industrial salvage ever prepared has just been published by the Technical Service Section, Industrial Salvage Branch, Salvage Division, War Production Board, and is now being distributed to industry.

The new book, entitled "Salvage Manual for Industry," contains 245 pages of systematically organized and classified information and data—most of it of a "how-to-do-it" nature—on industrial salvage practice in all its ramifications. Material is presented in 26 chapters, grouped into 6 major sections. There are 2 chapters on organizing and planning the salvage department; 3 on the administrative factors; 12 on methods of handling (finding, identifying, segregating, collecting, reclaiming, storing, selling etc.) metal scrap; 3 on non-metallic waste; 7 case histories demonstrating exemplary practice; a 17 page compilation of practical hints for handling specific waste materials; and a 9 page index.

Edited by 7 engineers. Paper-bound, 6 in. x 9 in., 250 pages. Price $.50 per copy. Procurable through the Superintendent of Documents, Government Printing Office, Washington, D. C.

Joseph S. Helm on Leave of Absence

For many years Manager of the Asphalt Sales Department of The Standard Oil Company of New Jersey, Mr. Helm is now on leave of absence, and will retire from active duty in April of next year, having completed 34 years of service.

Mr. Helm was one of the original organizers of The Asphalt Association (now Asphalt Institute) in 1918, and has been a Director since its organization, also a former President. This was a period of remarkable growth in the

asphalt industry, its annual sales in the 25 years from 1918 to 1943 increasing steadily from about 1,500,000 tons to 8,000,000, or over 500%.

Use of Cuprinol

Cuprinol, Inc.
7 Water St., Boston 9, Mass.

In an illustrated circular the effectiveness of Cuprinol in protecting wood against rot and insect borers is explained. It is used for preventing rot in guard rails, bridge timbers, double planking wharves, board walks, and for stopping further decay in wood historic buildings. Write for full information and price.

Micromax pH Recorders

Leeds & Northrup Company
4934 Stenton Ave., Philadelphia 44, Pa.

Wherever it is important for operators of industrial processes, such as neutralization, precipitation, corrosion-prevention and boiler feedwater treatment, to be able to "see" pH at a glance or to refer to a continuous pH record drawn on a handy, easy-to-file chart, a new catalog issued by Leeds & Northrup Co. should be of interest.

It describes an equipment which consists of just two elements: an unusually rugged glass-electrode assembly and a Micromax Recorder—either a strip-chart Model S or a round-chart Model R. Through the electrode assembly chamber flows a continuous sample of the process solution, where it completely covers the electrodes and a temperature compensator. The voltage thus set up is continuously measured by the Micromax which indicates and records directly in pH units.

For a copy of Catalog N-96 (1), "Micromax pH Recorders," write to the manufacturer.

The Dorrco Vacuator

The Dorr Co., Engineers
570 Lexington Ave., New York 22, N. Y.

The Dorrco Vacuator is a new unit developed primarily for the removal of grease and light, difficult-to-settle solids from sewage and trade wastes, prior to clarification. Behind its development is the fact that suspended solids in practically all domestic sewages and many industrial wastes contain a substantial percentage of such floatable solids. The use of vacuum flotation for their removal is a logical advance from scum skimming devices as used in conventional sedimentation units.

The Dorrco Vacuator consists of a cylindrical tank with a dome-shaped cover, in which a constant vacuum of approximately nine inches of mercury is maintained. After deaeration, the feed enters the tank through a central draft tube, from which it is distributed by means of a vertical flared-top section close to the liquor surface. Floated solids, buoyed up by the fine air bubbles, are sucked up to collect on the surface from which they are continuously removed by means of a special mechanism. The blades of the rotating mechanism are hinged, so that they can push the light solid matter up a ramp and into a trough, the top of which is slightly higher than liquid level. From the trough, the grease or scum drops to a barometric leg, which permits its continuous discharge.

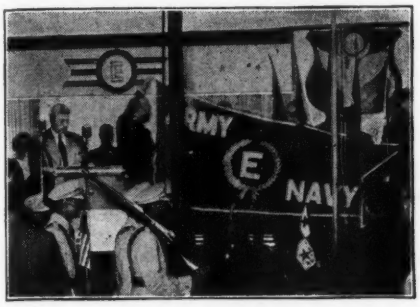
The effluent passes under a circular baffle and discharges over a weir into a peripheral channel. From here it flows to a sealed chamber, a barometric leg again being used to permit continuous gravity discharge against the vacuum.

Coarse solid particles that settle out to the bottom of the tank are raked to a central sludge outlet by means of a bottom mechanism. Both rotating mechanisms are driven by a central drive mounted on the top of the tank. As in the case of the scum and effluent outlets, the sludge outlet is also sealed off to prevent the loss of vacuum.

A constant vacuum is automatically maintained by means of a control chamber connected to the effluent launder. An adjustable pipe in the chamber is connected to a vacuum

pump and the open end of the pipe is set at a point slightly below the level of the effluent barometric leg. If abnormal conditions occur within the tank, the liquor level in the effluent barometric leg tends to rise. As the liquid seals off the open end of the vacuum pipe, water is drawn off until normal conditions are restored.

An illustrated folder giving more complete information including the field of operation of the Vacuator is available.



Army-Navy E ceremonies at Trackson Plant

Trackson Company Wins Coveted Army-Navy E Award

On August 31, 1943, the employees of the Trackson Company, Milwaukee, Wisconsin, were presented with the Army-Navy E Award for their outstanding effort in the production of ordnance material and tractor equipment for the Armed Forces. The brief but colorful ceremony was held at the main plant and the accompanying scene shows Trackson's President, W. H. Stiemke, and employee representative, F. J. Gapinski, proudly displaying the coveted pennant.

Davey Compressor Co.

Paul H. Davey, President of Davey Compressor Company, Kent, Ohio, has received a communication from the Under-Secretary of the Navy, conferring the Army-Navy "E" Award for outstanding production of war materials on the men and women of the Davey Compressor Company.

Link-Belt Company Announces Promotions

Edward J. Burnell, heretofore vice-president and general manager in charge of Pershing Road plant operations, has been transferred to the Executive Office of the company, 307 N. Michigan Ave., Chicago (1). In his new position Mr. Burnell will be vice-president in charge of sales for the entire Link-Belt Company. Assisting him will be Nelson L. Davis, sales manager for materials handling machinery; William H. Kinkead, sales manager for power transmission machinery and C. Walter Spalding, sales manager for power transmission equipment required by original-equipment manufacturers and duplicate machinery accounts.

Harold L. Hoefman, manager of the company's Atlanta plant, succeeds Mr. Burnell as general manager of the Link-Belt Pershing Road plant in Chicago.

Two Inch Cast Iron Pipe—Its Manufacture and Uses

This is the title of a paper prepared and read by Shirley Harris, Manager of the Chicago Office of McWane Cast Iron Pipe Co., at the Missouri Valley Section of the AWWA Convention, Des Moines, Iowa, Oct. 16.

Mr. Harris said that while the manufacture and use of 2" cast iron pipe is as old as the cast iron pipe industry itself, the modern development in making pipe of that size dates back to about 1922. From that date on there has been a steady increase in its use in waterworks systems.

Prior to that date, the yearly production and sale of 2" cast iron pipe was less than 30,000 feet a year. From

1938 to 1942 the average yearly production of 2" and smaller cast iron pipe was approximately 5,000,000 feet —or 16,000 tons.

This great increase in the use of small cast iron pipe is due to research and development in the manufacture requiring the expenditure of hundreds of thousands of dollars.

Some of the major improvements in manufacturing were chemically and physically controlled iron and sand, melting iron in a balanced draft cupola, mechanical ramming of the flasks, straight line continuous production, resulting in lower costs as well as a vastly better quality and strength in the pipe.

Mr. Harris went into considerable detail regarding the lengths, the methods of jointing, preventing leakage, tapping under pressure, etc. Copies of this complete address may be obtained from McWane Cast Iron Pipe Co., Birmingham, Ala.

E. W. Gray Represents Builders-Providence in Chicago

E. W. Gray, formerly located in the Philadelphia Office of Builders-Providence, Inc., manufacturers of flow metering and controlling equipment, is now associated with G. H. Jewell, 1852 Peoples Gas Building, Chicago. Mr. Jewell has represented Builders in that locality for over twenty-five years. Winfield S. Codell returns to Builders' Philadelphia Office, 2045 North Broad Street as assistant to Alan A. Wood.

Wentz Equipment Co., Topeka, Kansas, Represents Davey Compressor Co.

As a franchise dealer, Wentz Equipment Co. will handle Davey Portable and Industrial Compressors, Truck Power Take-Offs and Pneumatic Saws.

Turbine Equipment Co.

75 West Street, New York, N. Y.
Now Represents Yeomans Bros. Co.

This company has been made exclusive representative for all Yeomans products in the New York metropolitan area effective December 1. Yeomans Bros. Co. manufactures centrifugal pumps, rotary compressors and sewage treatment equipment.

An organization of 35 years standing, Turbine Equipment Co. has sold and serviced pumping equipment from its founding in 1908. President of the company is Russell Klemm, one of the founders. Harold Sinclair and Donald F. Miller are vice-presidents. They head a sales and service organization of 25 people.

BOOK REVIEW

How to make water and sewage analyses

By Theroux, Eldridge & Mallman; Laboratory Manual for Chemical and Bacterial Analysis of Water and Sewage. McGraw-Hill Book Co. 266 pp. $3.00.

This is a recent revision of a useful and handy book for men engaged in water and sewage treatment or elsewhere that a knowledge of analyses is required. In simple and understandable language, specific directions are given for making the tests necessary for the "control of water and sewage treatment plants, the analysis of polluted water and the examination of industrial wastes." A valuable feature of the text is the frequent use of illustrative calculations to help the non-expert. Some problems are also slated and worked out to show the method used.

In addition, various other topics are covered. The methods of sampling are discussed carefully and instructively and this section should be of help in stress-

ing, for non-laboratory folks, how samples must be taken to be of value—and no result of examination is of value unless the sample is truly representative. The general discussion of chemistry is good but might be expanded and it might be placed at the beginning of the book instead of in almost the exact center, since many of the folks who should use this text will need a little brushing up before they start making analyses. Furthermore, it has been the reviewer's observation that fully as many use this manual for purposes of general information as for detailed reference in making tests.

Three New Bulletins on Sewage Treatment Equipment

Published by Graver Tank & Manufacturing Co., 332 South Michigan Ave., Chicago 4, Ill.

One describes and illustrates in halftones and drawings, Graver Digesters and Gas Holders, another Graver Clarifiers, and the third Rotary Distributors. Copies will be sent upon request.

A New 40-page Catalog Issued by Jeffrey Mfg. Co., Columbus 6, Ohio

It describes equipment for Water, Sewage and Industrial Waste Treatment Plants. Among the products are: bar and disc type screens, screenings grinders, grit collectors, grit washers, sludge collectors for primary and final settling tanks, sludge elevators, Floctrols (controlled flocculation), scum removers, dry feed chemical machines, equipment for biofiltration plants, garbage grinders.

There are numerous halftone illustrations and drawings in the catalog. Write for a copy.

Morse Boulger Moves

Morse Boulger Destructor Co. moved to 205 East 42nd Street, New York 17, N. Y., December 1st.

DEATHS

Lion Gardiner

Lion Gardiner, Vice-President of the Jaeger Machine Co., passed away Nov. 2, 1943.

Mr. Gardiner was one of the "Old Timers" and Vice-President of the American Road Builders' Association. His understanding manner—his unbounded energy and enthusiasm—his good fellowship and counsel were an inspiration to everyone, and contributed greatly to every enterprise with which he was associated.

William H. Hansell

William H. Hansell, assistant chief of construction for the city of Atlanta, Ga., passed away on September 9, 1943, at the age of 70. He was a graduate of Georgia Tech. In the field of sanitary engineering, Mr. Hansell was a leader in the development of the sewerage system of the city of Atlanta.

William C. Perkins

William C. Perkins, chief engineer and secretary of the Eastern Paving Brick Association, passed away on October 27, 1943, at his home in Langhorne Manor, at the age of 75. Mr. Perkins practiced as a consulting engineer with the firm of Webb & Perkins, served as assistant engineer in charge of construction of Fairmount Park in Philadelphia, and later became resident engineer in charge of construction for the New York State Highway Department. He served the Eastern Paving Brick Association from 1919 to the time of his death.

(Continued on page 58)

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 54-57*

Maintenance of Hard-Surface Streets

(Continued from page 20)

fiscal year 1940-1941, a total of 18,472 tons was produced at an average cost complete in place of $3.87 per ton. The cost per ton naturally varies with output volume and the character of repair work being done, but Oklahoma City has produced asphalt from its plant for as little as $3.67 per ton (these figures are based on cost prior to declaration of war.)

One of the major contributing factors enabling Oklahoma City to produce asphalt at a comparative low price is the use of river sand, which constitutes the bulk of our sheet asphalt mixture. This sand is obtained from selected bars where the North Canadian river runs through city-owned property, and thus no royalty charges are involved, but only the cost of hauling. The contract price for sand delivered to the plant during the current year is $.40 per ton, and we have had as low a price as $.27 per ton delivered to stock pile. By reducing the unit cost over former years, we have been able to do a more thorough job of repair and resurfacing and cover considerable more mileage with no corresponding increase in budget appropriation.

While Oklahoma City feels that it has achieved some degree of success with its paving maintenance, more progress should and can be expected. The ultimate objective of all street and higway engineering should be construction of well designed, durable roadway surfaces, low in initial and maintenance cost.

Recovery of Grease From Sewage

(Continued from page 22)

lb. per day to 0.15 lb. per day, with a maximum of 0.59 lb. The extent to which grease can be recovered from sewage varies over a wide range (5). In the process of sludge digestion, grease is broken down. In the activated sludge process, it is oxidized. Thus both digested and activated sludge contain less grease than fresh sewage solids.

Because of the difficulty of determining grease in sewage, but little plant data are available. H. W. Gehm (6) offers a rapid method for determining grease in sewage and sludges by the use of mineral oil as an extractant, so that results can be obtained at the rate of at least six per hour on dried sludges or six per two hours on wet sludges, or on six sewage samples per three hours. The results are said to check with the acidification—petrolic-ether extraction now in use by Gehm.

(1) F. M. Dawson and A. A. Kalinske. "Some New Research and Test Data on Grease Interceptors." Plumbing & Heating Business, February, 1942.

(2) E. N. Mortenson. "Are You Losing War Materials and Dollars Down Your Sewer?" National Provisioner, April 24, May 1, 1943.

(3) C. P. Gunson. "Rendering of Sewage Grease at Civilian and Army Posts." Sewage Works Engr. *14*, 329. (PUBLIC WORKS, August, 1943, p. 48).

(4) A. P. Learned. "Wartime Operation and Maintenance Problems of Sewage Disposal Plants." Public Works Engineers Yearbook, 1943, p. 197.

(5) A. L. Fales and S. A. Greeley. "The Grease Problem in Sewage Treatment." Proc. Am. Soc. C. E. *68*, 193, 269, 804, 1071, 1178, 1627; *69*, 425.

(6) H. W. Gehm. "A Rapid Method for Determining Grease in Sewage and Sludges." Water Works & Sewerage, *90*, 305. (PUBLIC WORKS, September, 1943, p. 50.)

WMC's Definition of the Term "Sanitary Engineer"

(Continued from page 42)

The practice of sanitary engineering includes the following activities:

(a) Surveys, reports, designs, direction, management, and investigation of:

(1) Waterworks or sewerage systems, and closely related engineering structures.

(2) Projects relating to stream pollution, insect and vermin control or eradication, rural and camp sanitation, and waste disposal, housing sanitation, and milk control.

(3) Systems for the prevention of atmospheric pollution or the control of indoor air, especially the air of working spaces in industrial establishments (industrial hygiene engineering).

(b) Professional research and laboratory work supporting the activities listed in (a).

(c) Responsible teaching of sanitary engineering and closely related subjects in colleges or universities of recognized standing.

[1] Persons lacking in formal education but who otherwise meet the terms of the above definition may be considered as having the equivalent of a full four-year course in engineering in a college or university of recognized standing provided they have sufficient experience or training of the type defined above to substitute for the engineering education lacking. The basis of such substitution shall be two years of appropriate training or experience equivalent to one year of formal engineering education. and such persons shall be considered professional sanitary engineers for the purpose of the Procurement and Assignment Service of the War Manpower Commission.

[2] A college or university of recognized standing is defined as one which is accredited by a national or regional accrediting association such as the Association of American Universities, or the New England, Middle States, North Central, Southern, or Northwest Association of Secondary and Higher Schools, or one whose professional curriculum has been accredited by the Engineers' Council for Professional Development.

Assessment for Sewer Extension and Treatment Plant

A New Jersey borough assessed a piece of property within its boundaries for benefits resulting from a "local improvement" consisting of extension of the borough's sewer system by the owner's construction of lateral sewers and a pumping station to serve his property. In a certiorari proceeding by the owner against the borough for a review of the assessment, the New Jersey Supreme Court holds (River Edge Homes, Inc. v. Borough of River Edge, Bergen County, 33 A. 2d 106) that the assessment for benefits from the extension of the trunk sewer was proper. The sewage is carried off by the trunk sewer and the lands thereby served increased commensurately in value.

However, an ordinance of the borough authorizing the construction of a sewage disposal plant, to be paid for by general taxation, authorized a "general improvement" and not a "local improvement", so that owners' lands subsequently benefited thereby could not be assessed for the cost of that plant as for a local improvement, especially where other lands similarly benefited had not been assessed for any part of its cost. The disposal plant having been undertaken as a general improvement could not be transmuted into a local improvement, and, in the circumstances, to do so would be discriminatory. As empowered by the New Jersey statute, the Supreme Court fixed the amount assessable at the sums assessed for the extension of the sewer system.

Readers' Service Department

These booklets are FREE but distribution is restricted to those actively engaged in engineering or construction. Use the coupon below or write the manufacturer direct, mentioning PUBLIC WORKS.

Construction Materials and Equipment

Air Raid Shelters

3. New 8 page booklet pictures and describes a corrugated pipe shelter with gas tight end walls, emergency escape tunnel and other desirable features. Armco Drainage Products Assn., Middletown, Ohio.

Bridges

7. Teco Connectors, a new method of structural engineering, to spread the load on a timber joint more equally over the cross-section of the wood is described in new literature available from Timber Engineering Co., Dept. BS-2, 1319—18th St., N. W., Washington, D. C.

Cold Mix Plants

15. New catalogs and prices of Portable Bituminous Mixers in 6 to 14 ft. sizes for resurfacing and maintenance. Issued by The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

Cold or Wet Weather Construction

18. Cleaver Aggregate Heaters and Dryers, Hot Water Boosters, and Automatic Steam plants are designed to speed up cold or wet weather construction. Write for illustrated bulletins. Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Concrete Accelerators

31. New 48-page booklet in five sections explains clearly the effects, advantages and methods of using Calcium Chloride and Portland Cement mixes. Complete and packed with practical information; well illustrated; pocket size. Sent free on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.

Concrete Curing

33. 64-page manual of concrete curing with calcium chlorides. Complete, handy. Contains useful tables, well illustrated. Write the Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

Concrete, Early Strength

38. 64-page manual tells how to speed up year 'round concreting, shows how to secure high early strength and greater workability at temperatures either below or above freezing. Contains many actual examples of practical concreting operations; well illustrated with more than 60 photos, charts, graphs and tables. Calcium Chloride Assn., Penobscot Building, Detroit 26, Mich.

Concrete Mixers

44. Catalog and prices of Concrete Mixers, both Tilting and Non-Tilt types, from 3½S to 56S sizes. The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Drainage Products

70. Standard corrugated pipe, perforated pipe and MULTI PLATE pipe and arches — for culverts, sewers, subdrains, cattlepasses and other uses are described in a 48-page catalog entitled "ARMCO Drainage Products," issued by the Armco Drainage Products Association, Middletown, Ohio, and its associated member companies. Ask for Catalog No. 12.

Graders, Patrol

105. The Austin-Western 99M Power Grader with its powerful all wheel drive simplifies all construction and maintenance; handles difficult jobs with economy and efficiency; and does better work on grading, ditching, scarifying, snow plowing, loading, mixing, bulldozing, shoulder trenching and backsloping. Write for Bulletin 1946. Austin-Western Road Machinery Co., Aurora, Ill.

Mixing Plants, Asphalt

106. The Cleaver Asphalt Mixing Plant for an inexpensive plant mix and the Cleaver Tank Car Heater and Bituminous Booster are covered in illustrated catalogs sent on request by Cleaver-Brooks Co., 3112 W. Center St., Milwaukee, Wis.

Mud-Jack Method

107. How the Mud Jack Method for raising concrete curb, gutter, walls and street solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities — a new bulletin by Koehring Company, 3026 West Concordia Ave., Milwaukee, Wis.

Oil, Motor

109. "Here's Proof of Ring-Free Superiority," 32 pages, illustrated, outlines the principles of lubrication and explains how by simple tests you can measure the advantages of Macmillan Ring-Free Motor Oil. Write Macmillan Petroleum Corp., 530 West 6th St., Los Angeles, Calif.

Paving Materials, Bituminous

111. New "Tarvia Manual" is packed with useful data on how to build and maintain roads with Tarvia. Each step is illustrated with excellent action pictures, 64 pp. 103 ills. Write to The Barrett Div., 40 Rector St., New York, N. Y.

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120. Interesting new booklet tells how to lengthen the life of your pumps. Explains how a little care will save a lot of wear. Write today for your copy. Homelite Corp., 2403 Riverdale Ave., Portchester, N. Y.

121. New illustrated catalog and prices of Jaeger Sure Prime Pumps, 2" to 10" sizes, 7000 to 220,000 G.P.H. capacities, also Jetting, Caisson, Road Pumps, recently issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

123. New brochure by Gorman-Rupp Co., Mansfield, Ohio, illustrates and describes many of the pumps in their complete line. Covers heavy duty and standard duty self-priming centrifugals, jetting pumps, well point pumps, triplex road pumps and the lightweight pumps.

124. 16-page illustrated bulletin, SP-37, describes and illustrates complete C. H. & E. line of self-priming centrifugal pumps from ½" to 8", including lightweight models for easy portability. C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

Road Building and Maintenance

128. Motor Patrol Graders for road maintenance, road widening and road building, a complete line offering choice of weight, power, final drive and special equipment to exactly fit the job. Action pictures and full details are in catalogs Nos. 253, 254 & 255, issued by Gallon Iron Works & Mfg. Co., Gallon, Ohio.

129. Warco Hydraulic Control Motor Graders, Duplex Hydraulic Scoops and Whizzard, easily transported, rollers are described and illustrated in literature available from W. A. Riddell Corp., Bucyrus, Ohio.

Rock Drill Maintenance

130. New booklet presents through amusing cartoons useful hints on proper rock drill maintenance methods—what your men can do to get more work out of your tools with a minimum of expense for repairs and compressed air. Write The Cleveland Rock Drill Co., 3734 East 78th St., Cleveland, Ohio.

Rollers

133. New Tu-Ton roller of simple construction for use in rolling sidewalks along highways, playgrounds and other types of light rolling is fully described in a bulletin issued by C. H. & E. Mfg. Co., 3841 No. Palmer St., Milwaukee, Wis.

138. "The Buffalo-Springfield line of road rollers (tandem, 3-wheel, and 3-axle) are described in the latest catalog issued by the Buffalo-Springfield Roller Co., Springfield, Ohio."

139. "Ironeroller" 3 Axle Roller for extra smooth surfaces on all bituminous work. Booklet contains roller data and operation details. Hercules Co., Marion, Ohio

140. This well-illustrated 16-page catalog describes the tandem, autocrat, cadet, and roll-a-plane rollers, and explains what each is intended to accomplish. Write Austin-Western Road Mach. Co., Aurora, Ill.

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145. Cuprinol, a rotproofing chemical that protects wood from fungi and insects, yet has no offensive odor, is non-poisonous, does not corrode metal and can be painted over. Get full details in booklet from Cuprinol, Inc., 7 Water St., Boston, Mass.

Soil Stabilization

150. "High-Service, Low Cost Roads" is one of the newer booklets using an effective combination of picture and text to set forth the principles and advantages of road surface stabilization with calcium chloride. Complete, interesting and well illustrated. 34 pages. Sent by Solvay Sales Corp., 40 Rector St., New York, N. Y.

152. The Columbia Chemical Division will be glad to furnish to anyone interested complete information dealing with Calcium Chloride Stabilized Roads. This literature contains many charts, tables and useful information and can be obtained by writing Columbia Chemical Div., Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.

154. "Soil Stabilization with Tarvia"—An illustrated booklet describing The steps in the stabilization of roadway soil with Tarvia will be mailed on request by The Barrett Div., 40 Rector St., New York, N. Y.

155. Sterling Rock Salt for Frost Damage Prevention. Sterling Rock Salt for Base and Surface Stabilization. Two descriptive bulletins issued by International Salt Co. Inc., Scranton, Pa.

Spreader

187. Jaeger Paving equipment, including Mix-in-Place Roadbuilders, Bituminous Pavers, Concrete Bituminous Finishers, Adjustable Spreaders, Forms, etc.—4 complete catalogs of latest equipment in one cover, issued by The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio.

Surface Consolidation and Maintenance

188. Detailed and illustrated presentation of the method and procedure in consolidated operations; explains how sub-soils can be conditioned to resist softening and frost action; how surfacing can be consolidated to provide smooth all-weather riding surfaces; how they can be maintained so as to prevent disintegration and gravel loss. Write the Calcium Chloride Association, Penobscot Bldg., Detroit 26, Mich., for Bulletin No. 29.

Timber Structures

189. "Typical Designs of Timber Structures" contains plans for 45 representative structures that have been engineered with Teco Connectors. For free copy write Timber Engineering Co., Inc., Room 6GG, 1319—18th St., N. W., Washington, D. C.

Wellpoints

195. New complete catalog, "Griffin Pointed Wellpoint Facts," just issued. Covers pre-drainage, describing wellpoints jetting pumps, with tables, diagrams and illustrations. Griffin Wellpoint Corp., 881 E. 141st St., New York.

Street and Paving Maintenance

29v. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments with completely submerged pumps, tool heaters, surface heaters, road brooms, portable trail-o-rollers, etc. These are all described in detail and illustrated. This modern and up-to-date equipment for blacktop airport and road construction and maintenance is based upon experience and engineering research over a period of 42 years. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, O.

To Sharpen Digger Teeth

291. Manganese cast points for sharpening digger teeth provide quick economical repair by welding sharp teeth. Send for new bulletin PW49. Allied Steel Products, Inc., N. B. C. Building, Cleveland 14, Ohio.

Fire Apparatus

300. Detailed information and advice about specially engineered Ward LaFrance apparatus will be sent on request. Ward LaFrance Div., Elmira, N. Y.

Snow Fighting

Snow Plows

350. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow. Features, specifications and method of attaching. Carl H. Frink, Mfr., Clayton, 1000 Islands, N. Y.

Ice Control

351. "Make Icy Highways Safe for Traffic"—a new bulletin by Michigan Alkali Div., Wyandotte Chemicals Corp., Wyandotte, Mich., tells how to use calcium chloride for modern ice control.

352. Ice Prevention on Highways, Streets, and Airport Runways with Sterling "Auger Action" Rock Salt. An illustrated bulletin issued by International Salt Co. Inc., Scranton, Pa.

Sanitary Engineering

Aero Filter

356. Aero-Filter Design Data is given in a new 32-page catalogue. It contains information on Advantages of Aero-Filter Process, Single Stage vs. Multi Stage Treatment, Filter Loadings, Rates of Flow and Results, Filter Depths, Re-

circulation, Sewage Pumps and Pump Control. Approximately 15 pages of blue prints are included in this instructive catalogue. Write Lakeside Engineering Co., 222 W. Adams St., Chicago, for a copy.

Air Release Valves

357. **Automatic Air Release Valves for water, sewage and industrial uses are described and illustrated in new catalog issued by Simplex Valve & Meter Co., 6750 Upland St., Philadelphia, Pa.**

Analysis of Water

360. **"Methods of Analyzing Water for Municipal and Industrial Use" is an excellent 94 page booklet with many useful tables and formulas. Sent on request by Solvay Sales Corp., 40 Rector St., New York, N. Y.**

Activation and Aeration

367. **A valuable booklet on porous diffuser plates and tubes for sewage treatment plants. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installations, with sketches and pictures, specifications, methods of cleaning and studies in permeability. 20 pp. illustrated. Sent on request to Norton Company, Worcester, Mass.**

Blowers

370. All interested in low cost air for sewage disposal will want a copy of this catalog describing operating principles and specifications of Roots-Connersville Aerating Blowers. Write to Roots-Connersville Blower Corp., 301 Valley Ave., Connersville, Ind.

Brine-Making Equipment

378. The Lixate Process for Making Brine. A 36-page fully-illustrated booklet on the Lixate Process for making brine. It gives all the facts—installations, brine tables, diagrams, formulas.—International Salt Co. Inc., Scranton, Pa.

Chlorinators, Portable

379. **Complete data on new portable chlorinator designed to meet emergency calls quickly and efficiently. Write Wallace & Tiernan Co., Inc., Newark 1, N. J.**

380. **"Emergency Sterilization Equipment," a new bulletin describing the advantages of Dual Drive Chlor-O-Feeders which can serve as either a permanent chemical feeder or as a portable emergency chlorinator. Order from Proportioneers, Inc., 96 Codding St., Providence, R. I.**

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381. **A 20-page booklet describes and illustrates a full line of sewer cleaning equipment—Rods, Root Cutters, Buckets, Nozzles and Flushers. Write W. H. Stewart (Pioneer Mfr. since 1901), Jacksonville, Fla., or P. O. Box 767, Syracuse, N. Y.**

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384. **"Who, What, Why" outlines briefly the functions of the consulting chemist and chemical engineer. Covers various methods of cooperation, on different types of problems, with industry, with attorneys and with individuals. Foster D. Snell, Inc., 305 Washington St., Brooklyn, N. Y., will send a copy on request.**

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385. **For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioneers, Inc. % 96 Codding St., Providence, R. I.**

386. **New circular describes and illustrates the Var-I-Feeder, a new portable chemical feeder for water main sterilization, military use or other chemical treatment. Write Chem-Feeds, Inc., 77 Reservoir Ave., Providence, R. I.**

387. **Everson Sterelators for all kinds of chemical feeding in stationary and portable models are described in new bulletins issued by Everson Manufacturing Co., 214 West Huron St., Chicago 1, Ill.**

388. **PULSAFEEDERS. A flow-proportional liquid chemical feeder, reciprocating type, fluid motor driven. Operating parts completely isolated from the chemical being fed. Micrometer adjustment. For feeding against high or low pressure. Wilson Chemical Feeders, Inc., 211 Clinton St., Buffalo 4, N. Y.**

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389. **How to increase the capacity of filters through use of Anthrafilt and complete data on use of Anthrafilt for filters and sludge beds is contained in a revised pocket Manual issued by Anthracite Equipment Corp. For free copy write H. G. Turner, State College, Pa.**

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390. **Specifications for standard AWWA fire hydrants with helpful instructions for ordering, installing, repairing, lengthening and using. Issued by M & H Valve & Fittings Co., Anniston, Ala.**

391. See listing No. 410.

Flow Meters

392. **The primary devices for flow measurement—the orifice, the pitot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.**

Gas Holders and Digesters

393. **Digesters and Gas Holders for efficient collection and storage of sewage gas are described in an interesting illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago, Ill.**

Gates, Valves, Hydrants

394. **Gate, flap and check valves; floor stands and fittings. New catalog No. 34 gives detail information with dimensions for all types of new full line. M. & H. Valve & Fittings Co., Anniston, Ala.**

395. Complete booklet with much worthwhile water works data describes fully Ludlow hydrants and valves. Sent on request. Ludlow Valve Mfg. Co., Troy, N. Y.

396. See listing No. 410.

Gauges

398. The full line of Simplex gauges for filtration plants are illustrated and described in catalog issued by Simplex Valve and Meter Co., 6750 Upland St., Philadelphia, Pa.

Laboratory Equipment

403. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 80-page booklet. W. A. Taylor & Co., 7301 York Road, Baltimore, Md.

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404. "The Lubriplate Way" contains much valuable information on long-lasting Lubriplate lubricants which are especially adapted for difficult conditions such as parts that are immersed in sewage, water or steam. Write Lubriplate Division of Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.

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405. Street, sewer and water castings in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., Lafayette Boul. and Indiana Ave., South Bend, Ind.

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407. New bulletin illustrates Builders Air Relay system of transmission for the Venturi Meter which is particularly useful for liquids containing suspended solids like sewage. Eliminates corroson, clogged pipes, etc. Write Builders-Providence, Inc., Codding St., Providence, R. I.

408. "The Selection of Main Line Meters," a highly informative and useful presentation prepared by a competent engineer, J. C. Thoresen, describes forms of differential producers and quickly solves typical problems with the use of graphic charts. Write Builders-Providence, Inc., 9 Codding St., Providence, R. I.

Pipe, Cast Iron

409. Handbook of Universal Cast Iron Pipe and Fittings, pocket size, 104 pages, illustrated, including 14 pages of useful reference tables and data. Sent by The Central Foundry Co., 386 Fourth Ave., New York 16, New York.

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411. "Cast Iron Pipe and Fittings" is a well illustrated 44 page catalog giving full specifications for their complete line of Sand Spun Centrifugal Pipe, Fire Hydrants, Gate Valves, Special Castings, etc. Will be sent promptly by R. D. Wood Co., 400 Chestnut St., Philadelphia, Pa.

Pipe, Lock Joint

412. Lock Joint Reinforced Concrete Sewer Pipe. Pressure Pipe, Culvert Pipe, Centrifugal Pipe and Subaqueous Pipe is described and illustrated in bulletins available from Lock Joint Pipe Co., Ampere, N. J.

Pipe, Transite

414. Two new illustrated booklets "Transite Pressure Pipe" and "Transite Sewer Pipe" deal with methods of cutting costs of installation and maintenance of pipe lines and summarize advantages resulting from use of Transite pipes. Sent promptly by Johns-Manville Corp., 22 East 40th St., New York, N. Y.

Pipe Joints Sewer

415. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston, Adams, Mass.

Pipe Joint Compounds

418. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis, Tenn.

421. Peerless pumps in a variety of types, with oil or water lubrication and any power drive, to pump water from any depth are described and illustrated in new literature that clearly shows their construction and special features. Write Peerless Pump Div., Food Machinery Corp., 301 W. Ave. at 26th St., Los Angeles, Calif.

422. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago, Ill.

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430. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 48-page booklet you should have a copy of. Ask Ford Meter Box Co., Wabash, Ind.

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434. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

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440. "Disposal of Municipal Refuse." Complete specifications and description including suggested form of proposal; form of guarantees; statements and approval sheet for comparing bids with diagramatic outline of various plant designs. 18 pages. Address: Morse Boulger Destructor Co., 216-P East 45th St., New York 17, N. Y.

442. Recuperator tubes made from Silicon Carbide and "Fireclay" Corebusters for maximum efficiency are described and illustrated in bulletin No. 11 issued by Fitch Recuperator Co., Plainfield National Bank Bldg., Plainfield, N. J.

443. Nichols Herreshoff incinerator for complete disposal of sewage solids and industrial wastes—a new booklet illustrates and explains how this Nichols incinerator works. Pictures recent installations. Write Nichols Engineering and Research Corp., 60 Wall Tower, New York, N. Y.

Softening

444. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

445. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

447. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Swimming Pools

448. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

Taste and Odor Control

449. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y.

450. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

452. Three types of clarifiers for sewage treatment are illustrated and described in a new bulletin issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago, Ill.

453. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

454. All-steel Rotary Distributors, correctly designed for the small and medium sized sewage plants, are the subject of a new, well illustrated booklet issued by Graver Tank & Mfg. Co., 332 South Michigan Ave., Chicago, Ill. This booklet also covers distributors for various types of high-rate trickling filters.

455. New booklet (No. 1642 on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Company, 2045 W. Hunting Park Ave., Philadelphia.

456. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures, and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Pa.

457. New illustrated folder (1942) on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia, Pa.

458. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

459. A combination mechanical clarifier and mechanical digester, The Dorr Clarigester, is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

461. Preflocculation without chemicals with the Dorrco Clariflocculator in a single structure is the subject of a new booklet issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

462. Dorrco Monorake for existing rectangular sedimentation tanks, open or closed, is described and illustrated in a new catalog sent on request. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

465. The complete line of Jeffrey equipment for water, sewage and industrial wastes treatment is illustrated and described in a handsome, new, 40-page catalog just issued by The Jeffrey Mfg. Co., 947-99 North Fourth St., Columbus 16, Ohio.

Underdrains, Trickling Filter

468. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh, Pa., for free copy

Valves (See Gates, Air Release, etc.)

Water Treatment

470. If you have a water conditioning problem of any kind, write Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago, Ill., who manufacture all types of conditioning equipment and will be pleased to make recommendations.

Water Service Devices

500. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati, Ohio.

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 54-57*

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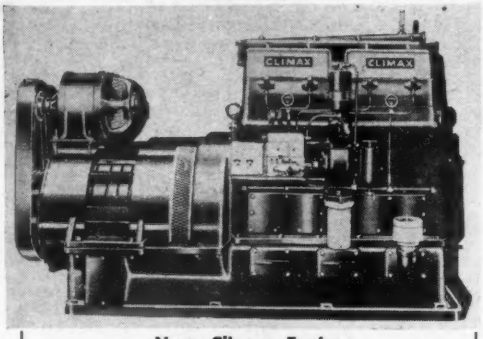
Keeping Up With New Equipment

(Continued from page 49)



New Climax Engine

Two New Diesel Engines

Climax Engineering Company
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Both new engines are 4-cycle, full diesels and intended for use as light plants and primary drives for pumps, compressors, etc.

Model D148 is a two-cylinder unit with a maximum rating of 22 h.p. It may be equipped for pulley drive with or without clutch or clutch and reduction gear or auxiliary power take-off. As a diesel electric plant it may be direct connected, on a single base, with a 15 kva generator.

Model D297 is a four-cylinder unit with a maximum rating of 44 h.p. Drive equipment similar to Model D148 may be furnished. A special feature of D297, however, is that a flywheel, clutch, generator or marine gears may be installed on either or both ends, providing a radiator is not used. For electric power and light, the D297 may be used to power a 30 kva generator.

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New Kotal Sales Manager Francis P. Smith, Jr.

A Navy flyer in the first World War, Mr. Smith has been active in the asphalt industry for 26 years. Originally associated with his father's firm, Dow and Smith, the well-known paving consultants of New York, Mr. Smith later served the Texas Company and then the Union Oil Company of California, becoming manager of the asphalt department.

Bouland Now Secretary, Street and Highway Lighting Safety Bureau

Hal M. Bouland of Columbus, Ohio, has been made Secretary of the Street and Highway Lighting Safety Bureau, 155 East 44th St., New York, N. Y. Mr. Bouland succeeds Alleyn H. Beamish who is now with the Tax Foundation. Mr. Bouland comes to this post from Ohio where he was associated with State Highway Director Hal G. Sours.

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IN THIS ISSUE

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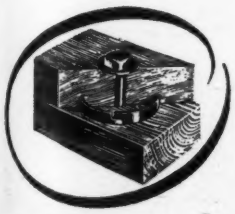

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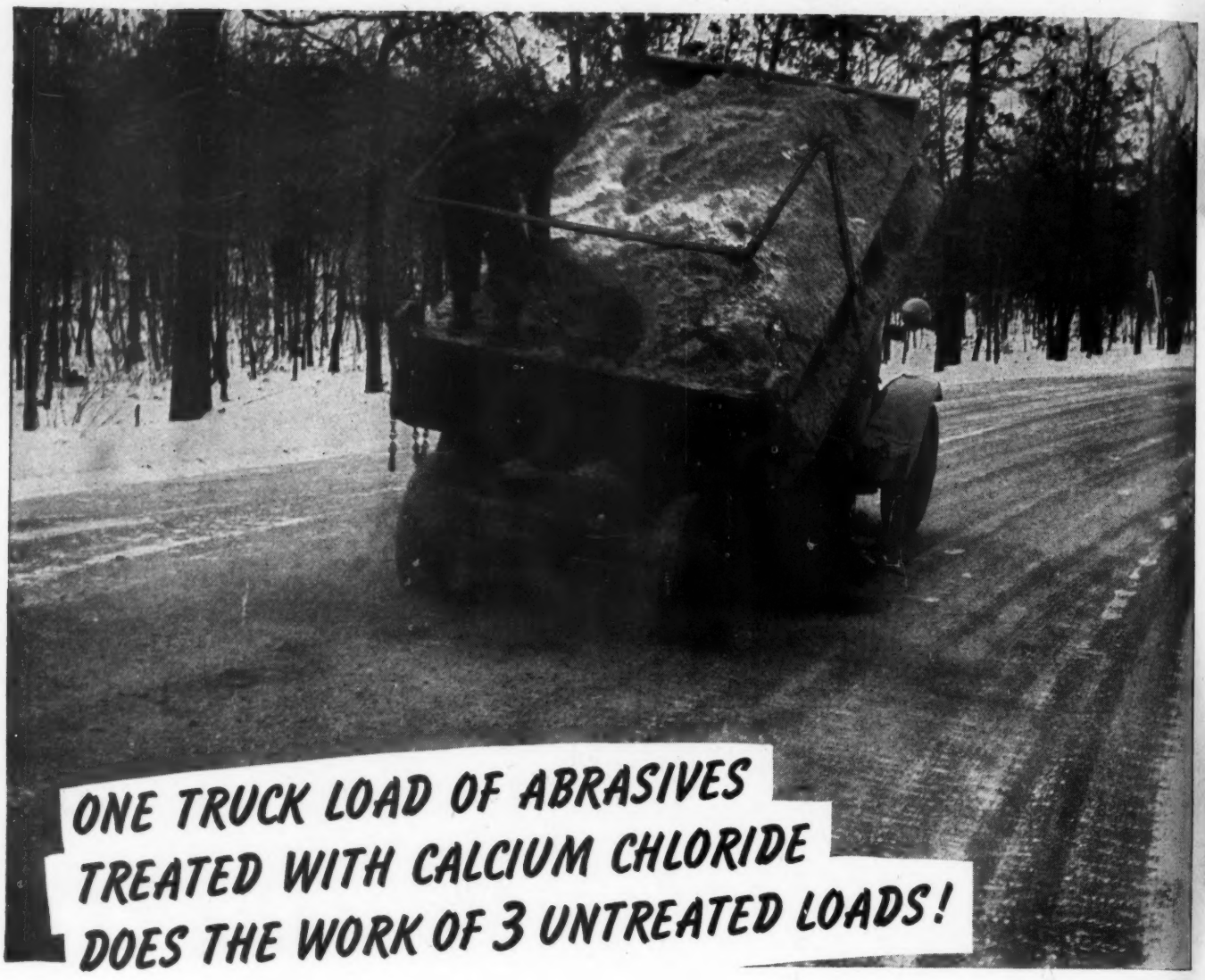

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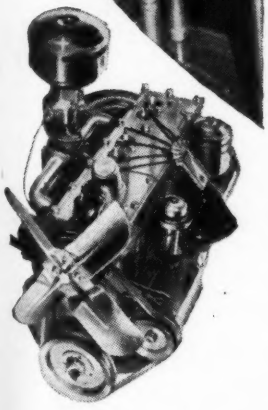

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